Nova Scotia

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ANNUAL REPORT

for the fiscal year
ending March 31, 1988

Department of Mines and Energy

91-03131/

PROVINCE OF NOVA SCOTIA
DEPARTMENT OF MINES AND ENERGY

The Honourable Alan R. Abraham, CD
Lieutenant-Governor of Nova Scotia

Sir:

I have the honour to submit herewith the Annual Report of the Department of Mines and Energy of the Province of Nova Scotia for the period April 1, 1987, to March 31, 1988.

Respectfully submitted,

Ken Streatch
Minister of Mines and Energy

PROVINCE OF NOVA SCOTIA
DEPARTMENT OF MINES AND ENERGY

The Honourable Ken Streatch
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Sir:

I have the honour to submit herewith the Annual Report of the Department of Mines and Energy for the period April 1, 1987, to March 31, 1988.

Respectfully submitted,

John J. Laffin

John J. Laffin, PEng, FEIC
Deputy Minister

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DEPUTY MINISTER'S REPORT

John J. Laffin, P.Eng, FEIC

The Department of Mines and Energy has a broad mandate to encourage research and development leading to increased energy and mineral resources and to promote their orderly development, regulation and use. To accomplish this mandate, the Department manages a wide variety of projects and programs from energy conservation to mineral deposit investigations. The Department provides many services to the people of Nova Scotia, industry and government agencies.

Much of this work is assisted and supported by co-operative federal-provincial agreements. At present three agreements are in place that provide to assistance to develop alternative energy resources and to strengthen and promote the mineral industry in Nova Scotia.

The Canada-Nova Scotia Oil Substitution and Conservation Agreement was initiated to decrease Nova Scotia's dependency on imported oil through conservation and increased use of alternate energy sources including coal. The Memorandum of Understanding on Conservation and Alternate Energy offers additional funding for alternate energy and conservation programs.

In the Mines and Minerals Branch, the Canada-Nova Scotia Mineral Development Agreement (CNSMDA) continues in force until March 1989. This five year agreement, signed in June 1984, is valued at $26.9 million. Through its five programs — geoscience, mineral development, mineral research and technology, mineral investment stimulation and public information — the agreement is designed to strengthen and promote the mineral industry in Nova Scotia.

Co-operative work on mineral resources investigations by the Geological Survey of Canada and the Department, through the CNSMDA, has stimulated the private sector's search for minerals in Nova Scotia and has assisted in a major expansion of mineral exploration and development. Approximately $45 million was spent for exploration and development, principally for gold, by the mineral industry during the 1987 calender year. This expenditure represents a record amount for exploration and development activity in Nova Scotia and a major increase from the $20 million spent in 1986. During the same time period the number of exploration licenses increased from 1306 in 1986 to 1465 in 1987 and the area held under exploration license from 605 000 ha in 1986 to 893 500 ha in 1987.

Optimism for the future of the mineral resources sector continues. Major exploration and underground development programs continue for gold, coal, industrial minerals, and aggregates. During 1987, the value of mineral

production reached $440 million compared to $388 million in 1986. The staff of the Department worked with many production companies to provide assistance in assessing mineral deposits, increasing mineral recovery and decreasing energy use. Nova Scotia's mineral production and the direct, indirect and induced economic benefits from the mineral industry contributed substantially to the provincial economy.

Geological and mining engineering students in Nova Scotia universities, colleges and schools received practical training through summer employment with the Department. The expanded field and office work created by the many CNSMDA projects gave employment to more than 40 students.

The Department continued to monitor petroleum and natural gas exploration work onshore and offshore, issues related to offshore resources, natural gas marketing and pricing policies, and Canadian and United States regulatory issues.

At the end of the fiscal year, 509 921 ha were under active exploration license. Three wells were drilled in the offshore during 1987-88. Petro-Canada drilled the Panuke F-99 well and demonstrated the westerly extent of the Panuke oil reservoir. During a unique six day testing period, 3 600 cubic metres of oil were pumped from the well into an adjacent tanker. The oil was taken to Montreal for refining and further testing. This was the first shipment of crude oil from the offshore areas of Canada's east coast.

Two other wells, Petro-Canada Como P-21 and Canterra Whycocomagh N-90, were drilled and abandoned.

A number of programs have been developed by the Department, some with assistance from federal-provincial energy conservation agreements, to conserve energy in keeping with the Government of Nova Scotia's long-term commitment to energy self-sufficiency. During the year 271 small businesses and government offices received energy audits to assist them in developing energy alternatives and conservation. The progress of energy conservation is represented by the decrease in refined petroleum products use from 5.3 million cubic metres in 1978 to less than 3.99 million cubic metres in 1987. During the fiscal year, petroleum accounted for 62.9 per cent of primary energy consumption, up slightly from 62.5 per cent in 1985-86.

The Department funded research for the use of coal-water fuel (carbogel), coal gasification and coal liquefaction as alternate forms of coal. The work of the Department strengthens the knowledge of coal resources and potential uses for coal in the province. The Deputy Minister continues as Chairman of the Committee on Atlantic Coal, a group that promotes research and development for coal mining and utilization in the region.

Working with the highly motivated and professional staff of the Department is a pleasure. Their work, achievements and publications are described in the following pages. I wish to thank the Minister of Mines and Energy, the Honourable Ken Streatch, for his advice and assistance during the year.

Nova Scotia is well endowed with mineral and energy resources. The steady production growth of industrial minerals, coal, aggregates and tin along with major gold development projects has encouraged the exploration and mining sectors and greatly aided the provincial economy. Nova Scotia is a good location for the development of energy and mineral related projects because of its varied geology, strong workforce, geographical location and deep-water ports, and history of mineral and energy development.

ORGANIZATION AND PERSONNEL OF THE DEPARTMENT

ORGANIZATION

The Department of Mines and Energy is organized into six divisions. Three of these divisions, Mineral Resources, Mineral Development and Mining Engineering are grouped together in the Mines and Minerals Branch under an Assistant Deputy Minister (ADM). The Energy Resources, Energy Management and Economics and Statistics Divisions form the Energy Branch, also under the direction of an ADM. The two ADMs and the Director of the Administration Division report to the Deputy Minister. The organization of the Department as of 31 March 1988 is shown in Figure 1.

CHANGES IN ORGANIZATION

The Economics and Statistics Section of the Energy Management Division was reorganized and elevated to division status. Vicki Harnish was appointed Division Director. The Mineral Resources Division was reorganized into three sections from one: Regional Surveys, Mineral Deposits and Geochemistry and Quaternary Geology.

RESPONSIBILITIES

Mineral Resources Division: responsible for the assessment of the province's mineral potential:

- Investigates the geology and documents mineral occurrences of the province through its own scientific programs and through analyses of private sector exploration activities
- Provides nontechnical information, through maps, brochures, pamphlets and talks, about geology and mineral resources as well as exploration and mining in Nova Scotia

Mining Engineering Division: responsible for ensuring that Nova Scotia mines are developed according to current safety, environmental and mining practices and regulations:

- Conducts engineering studies
- Approves mining plans
- Administers departmental diamond drilling operations

Mineral Development Division: responsible for issues involving the exploration and utilization of the province's mineral resources:

- Maintains a mineral and petroleum rights registry
- Assists development of mineral resources

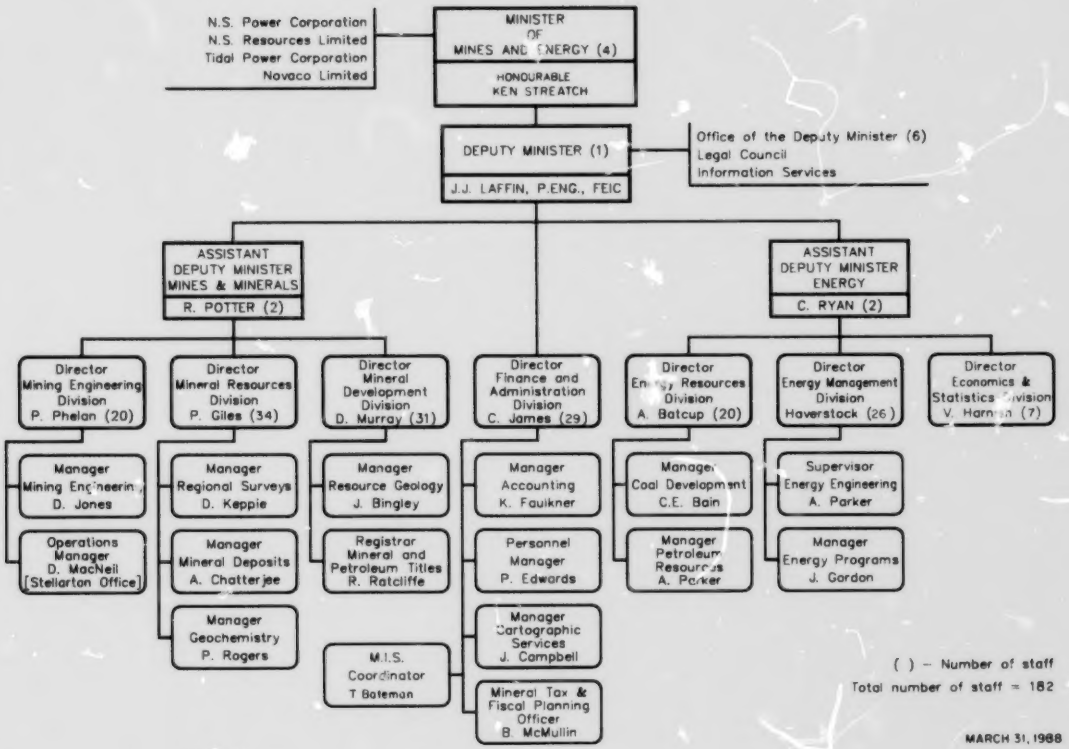

N.S. Power Corporation
N.S. Resources Limited
Tidal Power Corporation
Novaco Limited
MINISTER OF MINES AND ENERGY (4)
HONOURABLE KEN STREATCH
DEPUTY MINISTER (1)
J.J. LAFFIN, P.ENG., FEIC
Office of the Deputy Minister (6)
Legal Council
Information Services
ASSISTANT DEPUTY MINISTER MINES & MINERALS
R. POTTER (2)
ASSISTANT DEPUTY MINISTER ENERGY
C. RYAN (2)
Director Mining Engineering Division P. Phelan (20)
Director Mineral Resources Division P. Giles (34)
Director Mineral Development Division D. Murray (31)
Director Finance and Administration Division C. James (29)
Director Energy Resources Division A. Batcup (20)
Director Energy Management Division Haverstock (26)
Director Economics & Statistics Division V. Harmon (7)
Manager Mining Engineering D. Jones
Operations Manager D. MacNeil [Stellarton Office]
Manager Regional Surveys D. Keppie
Manager Mineral Deposits A. Chatterjee
Manager Geochemistry P. Rogers
Manager Resource Geology J. Bingley
Registrar Mineral and Petroleum Titles R. Ratcliffe
M.I.S. Coordinator T Bateman
Manager Accounting K. Faulkner
Personnel Manager P. Edwards
Manager Cartographic Services J. Campbell
Mineral Tax & Fiscal Planning Officer B. McMullin
Manager Coal Development C.E. Bain
Manager Petroleum Resources A. Parker
Supervisor Energy Engineering A. Parker
Manager Energy Programs J. Gordon
( ) – Number of staff
Total number of staff = 182
MARCH 31, 1988

FIGURE 1. Organization of the Department.

- Operates a technical publications library in Halifax and in Stellarton
- Maintains a core library and repository in Stellarton
- Monitors all private sector exploration work

Energy Resources Division: responsible for the development of the province's indigenous energy resources, specifically peat, coal, petroleum and natural gas:

- Monitors and regulates all petroleum exploration and development
- Undertakes coal and peat exploration programs
- Promotes energy resource development

Energy Management Division: responsible for issues involving the supply of energy from outside the province and the demand for and utilization of energy within the province:

- Develops economic analyses and statistics on energy matters
- Provides engineering services related to energy use
- Develops and administers energy conservation programs
- Provides public with energy information

Economics and Statistics Division: responsible for co-ordination and planning of provincial energy activities and policy advice:

- Provides economic and statistical analyses relating to energy matters
- Provides policy advice on energy matters

Administration Division: responsible for providing financial and other support services to the divisions:

- Provides accounting, mineral taxation, legal and personnel services
- Administers coal mine/miner financial aid programs
- Provides cartographic and photographic services
- Provides accounting services for Novaco Ltd.

PERSONNEL AND OFFICES

The Department has 182 employees, most of whom are employed in Halifax and Stellarton.

Halifax

Founders Square, 1701 Hollis Street

Mines and Minerals Branch	424-5346
Mining Engineering Division	424-5764
Mineral Development Division	424-4162
Energy Branch	424-5351
Energy Resources Division	424-5933
Energy Management Division	424-5019
Economics and Statistics Division	424-8161

Administration Division 424-4629

Brewery Complex, 1496 Lower Water Street
Mineral Resources Division 424-4700

Stellarton

32 Bridge Avenue 752-8430

Mineral Development Division
Engineering Division
Energy Resources Division

MINES AND MINERALS BRANCH

R.R. Potter, PhD
Assistant Deputy Minister

The mineral resources of Nova Scotia and the mines that produce them are an important part of the provincial economy. These mining activities provide direct employment for more than 5,900 people. The development and well-being of the province's mineral resources sector is an essential part of the work of the Mines and Minerals Branch.

The Branch has a mandate to promote the understanding of the province's mineral resources and geology of the province; the exploration, development and efficient production of mineral deposits; and the maintenance of safe and environmentally acceptable mining practices.

Three divisions report to the Assistant Deputy Minister. The Mineral Resources Division explores, assesses and publicizes the province's mineral wealth. The Mining Engineering Division ensures that mineral deposits in Nova Scotia are developed according to current safety, environmental and mining practices. The Mineral Development Division promotes the exploration and utilization of the province's mineral resources.

MINERAL RESOURCES DIVISION

Peter S. Giles, PhD, Director

INTRODUCTION

The Mineral Resources Division provides the Department of Mines and Energy, other government agencies, members of the mineral exploration community and the public with timely and objective descriptions and assessments of the province's geology and mineral resources.

The orderly development of Nova Scotia's mineral resources requires a thorough knowledge of the geology of the province. This information is useful to many other users and is often essential to the understanding of environmental hazards and land use planning.

The Division's activities have been expanded through the programs of the Canada-Nova Scotia Mineral Development Agreement (CNSMDA). This five year agreement began in 1984 and will provide $26.9 million, $16.1 million from Canada and $10.8 million from Nova Scotia, to stimulate and strengthen the mineral industry in Nova Scotia.

Thirty geologists are employed in mineral resources investigations, editing and publishing, and education and public awareness. The activities of the Division are:

- determining the mineral potential of known deposits
- searching for indications of new deposits through regional geochemical sampling and geological mapping
- publicizing the results of investigations by oral presentations at scientific meetings, scientific journals, NSDME publications and "popular" brochures and booklets

CHANGE IN ORGANIZATION

The Department received approval from the Management Board and the Civil Service Commission to create three sections in the Mineral Resources Division. These are Regional Surveys (J.D. Keppie, Manager), Mineral Deposits (A.K. Chatterjee, Manager), and Geochemistry and Quaternary Geology (P. Rogers, Manager).

ACTIVITIES

Geological investigations in progress include regional bedrock mapping, mineral deposit studies, geochemical surveys, a study of Quaternary glacial deposits and

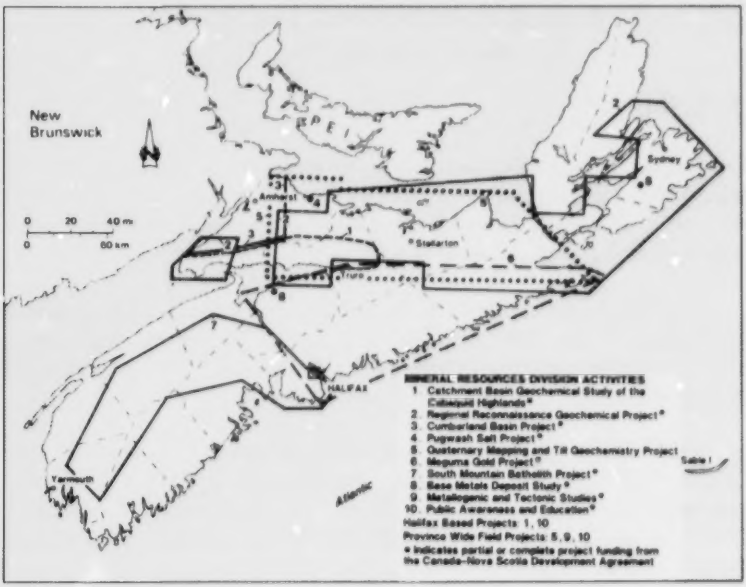


FIGURE 2. Project locations of Mineral Resources Division.

their geochemistry and regional assessment of the role of plate tectonics in mineral deposit genesis. The location of these projects is shown on Figure 2. In addition, the Division has undertaken a program entitled the Education and Public Awareness Program, to bring to the public an appreciation of the Province's mineral industry and its importance to Nova Scotia's continued economic development. All activities are completely or partially funded by the CNSMDA.

The Division continues to emphasize the importance of mining and mineral exploration through a variety of educational programs designed for the general public. In addition, considerable emphasis is placed on the timely preparation of technical reports and maps, which enable new data generated to be applied for a variety of purposes relevant to resource development.

Division members were actively involved in the management of programs funded by the CNSMDA during the fiscal year. The director is a member of the Management Committee and co-chairperson of the Geoscience Subcommittee. The Regional Surveys manager is the CNSMDA co-ordinator. The head of the Education and Public Awareness Program is co-chairperson of the Public Information Sub-committee.

Regional Surveys Section
J. D. Keppie, PhD, Manager

INTRODUCTION

The Regional Surveys Section provides detailed and reconnaissance geological and geophysical mapping of the province. The Section's purpose is to develop an understanding of the geological history of Nova Scotia and how it has influenced the formation of mineral deposits.

The Section provides support for the Branch Education and Public Awareness Program. Funding from the CNSMDA's Geoscience and Public Information programs supports most of the Section's activities.

PROJECTS

Two projects are currently underway. One is designed to provide a better geological understanding of the northern part of the province (parts of Cumberland, Colchester and Pictou Counties). The other is a compilation of mineral resources and geological data to broaden the understanding of plate tectonic processes in mineral deposit genesis.

Cumberland Basin Study

The Cumberland Basin is a large area of sedimentary rocks stretching from Springhill area through Oxford to Tatamagouche in Cumberland, Colchester and Pictou Counties. The purpose of the work is to provide an understanding of the rock succession, their ancient environments and their mineral resources. The region is known to have reserves of salt and coal and occurrences of copper, lead, zinc, uranium, vanadium, gold and silver. The Province's two salt mines are located in this basin. There is potential for discovery of potash in these and other salt deposits.

The Canadian Salt Company mine at Pugwash is part of a detailed study of salt deposits and related minerals occurrences. A geologist is mapping the salt deposits underground to understand how these deposits formed.

During the 1987 field season detailed coastal mapping of the coal bearing Cumberland Group was completed from Joggins southward to Spicers Cove. The same group of rocks was mapped south and west of Oxford. Younger Carboniferous rocks were mapped around Amherst.

Metallogenic Map Project

This project is designed to stimulate exploration for known and suspected occurrences of minerals in the province through an interpretation of plate

tectonic processes. The end product will be a map and memoir showing the important structural features of Nova Scotia (faults and folds) and their associated mineral occurrences (metallogenic map). The importance of this work is that it becomes a tool in assessing and predicting the province's mineral occurrences and mineral potential.

During the summer of 1987, field work in Antigonish County helped to unravel the sequence of events responsible for many small base metal showings. Detailed mapping followed by laboratory work is necessary to develop an understanding of the structural and mineralizing events. Later, to prepare the metallogenic map, these studies of small areas are amalgamated into a broad understanding of various geological regions.

EDUCATION AND PUBLIC AWARENESS PROGRAM

The purpose of the Education and Public Awareness Program is to produce and promote educational information about the geology, mineral resources and mining history of the province as well as the geological projects of the Mines and Minerals Branch. The Prospecting Course, displays, walking tours, annual Open House and publications are ways of meeting this goal.

During the fourth year of the CNSMDA, the staff of the Education and Public Awareness Program continued projects to further the goals of the CNSMDA Public Information Program. Displays feature information about the CNSMDA and describe in detail some of the projects. Special publications were prepared and published to describe some of the CNSMDA's programs and their benefits to the mineral industry.

Prospecting Course

A prospecting course was not offered during the 1987-88 fiscal year. The Education and Public Awareness Group worked with the Chamber of Mineral Resources of Nova Scotia in the planning and preparation of a revised prospecting course as well as the development of an advanced course.

Displays

The Education and Public Awareness Program is responsible for displays describing mineral resources and mining in the province and the projects of the Mines and Minerals Branch. Displays at technical meetings and various exhibitions across Nova Scotia during the fiscal year presented information about previous gold mining, mineral exploration and development, the province's mineral resources and the CNSMDA's programs.

During the summer of 1987, displays were exhibited in 17 locations across the province. In addition, major displays were prepared for the Nova Scotia Forestry Exhibition (Windsor), the Mining Society of Nova Scotia (Ingonish), the Rockhound Roundup (Parrsboro), and the Prospectors and Developers Association of Canada (Toronto).

There were two major displays at the annual meeting of the Prospectors and Developers Association of Canada. One display introduced the Department and the mineral potential and mineral exploration in the province. The second display focused on gold mineralization in sedimentary basins and the potential for base metal mineralization in Nova Scotia.

Open House

The Mines and Minerals Branch hosts the annual Open House and Review of Activities. In 1987, the event was held on November 25 and 26 at the Lord Nelson Hotel, Halifax. More than 350 people attended the function to hear talks and see displays by geologists from the Department, the Geological Survey of Canada and Nova Scotia universities. A highlight of this Open House was the special symposium on "Mineralization in Nova Scotia", co-sponsored by the Chamber of Mineral Resources of Nova Scotia and the Department.

Walking Tours and Other Educational Projects

Walking tours of downtown areas, parks and tourist areas are becoming very popular. Fourteen walking tours were organized during the fiscal year; those in the summer were delivered in co-operation with the Nova Scotia Museum. More than 350 people enjoyed learning about the mineral resources and mining, land form development and geology of different parts of Nova Scotia.

The Education and Public Awareness Group is working with the Nova Scotia Museum to prepare "The Mining Kit" which will be available on loan. It is designed for grade eight science and emphasizes mineral resources and mining in the province.

EDITING AND PUBLISHING SERVICES

Detailed technical publications are the principal means of communicating information about the geology and mineral resources of Nova Scotia. The technical reports are published either as part of the Department's publications series or in scientific journals. The Education and Public Awareness Program produces brochures and pamphlets for the general public. All of these publishing activities are supported by a senior editor, an editor and two word processing operators.

The division staff presents numerous talks and lectures at technical displays, universities and community groups.

Technical summaries for each of the projects appear in the annual *Mines and Minerals Branch Report of Activities*. Brief descriptions of each project appear in the annual Open House and Review of Activities publication *Report of Activities, Part A*. A list of publications by Division geologists of the Division, as well as other Departmental publications, appears in Appendix A.

Mineral Deposits Section
A. K. Chatterjee, PhD, Manager

INTRODUCTION

The Mineral Deposits Section has the responsibility of providing information about the mineral deposits and mineral resource potential of the province. It accomplishes this mandate by detailed mapping of mineral deposits and mines, mapping of large areas with strong mineral potential, and laboratory research into the genesis of selected mineral deposits. Information of this type is valuable for exploration companies, other government agencies and land use planning.

PROJECTS

Four major projects were undertaken during the 1987-88 fiscal year with funding from the CNSMDA Geoscience Program.

South Mountain Granite Project

The project's goal is to explore the geology and mineral deposits of the granite intrusion which stretches from Halifax to Yarmouth. The granite hosts the East Kemptville tin-zinc-copper-silver mineral deposit and other deposits of tungsten, gold, molybdenum, manganese, beryllium and rare earths.

The summer of 1987 was the third field season for this project. Work was divided between two teams of geologists mapping the bedrock and the surface deposits of the area west of Route 14, centred in northern Lunenburg County.

By studying and mapping the granite bedrock geologists are able to assess the granite's mineral potential. Regional and detailed mapping, laboratory work and chemical analyses of rocks define how the granite and its mineral deposits formed. This in turn leads to better ways of searching for mineral deposits in the granite.

The study of the loose glacial sand and gravel (till) deposits covering the granite forms the second part of the project. The purpose of this part is to study the glacial geology, assess the mineral potential of the covered granite bedrock through chemical analysis of the glacial till, and attempt to fit the glacial history into the regional history.

Results of work from both parts of the project are published in *Report of Activities, Parts A and B* (see Appendix I). Coloured maps with marginal notes are now available for the eastern end of the South Mountain Granite (East of Route 14). Preliminary maps of the areas west of Route 14 will be available as open file maps shortly.

Liscomb Complex Project

As part of the geological work funded by the CNSMDA, all granite bodies in southern Nova Scotia will be investigated by the Geological Survey of Canada and the Department. One of these granite bodies is the Liscomb Complex located on the northwestern edge of the Liscomb Game Sanctuary, Halifax County.

Several field seasons of mapping and laboratory research have shown that the majority of rock is not granite in this area. Seven small, distinct granite intrusions were defined, but of greater interest has been the dark-coloured igneous rocks (gabbros), breccia pipes and metamorphic rocks (gneisses). Fragments found in the pipes and dykes are probably from the base of the crust and represent the first insight to the nature of the rocks below the gold-bearing Meguma Group. The study of this rock suite will allow geologists to understand more clearly the way in which granites and related mineral deposits are formed.

Meguma Gold Project

The gold-bearing rocks of the Meguma Group are found across southern Nova Scotia from Canso to Yarmouth. Historically, this part of Nova Scotia supported mining in 64 gold districts from 1861 to 1940, with a total production of over 85 million g. Geologists working on this project are re-examining some of these former gold-producing areas to stimulate exploration for gold.

Field work during the 1987 summer was directed toward comparing and contrasting the styles of gold mineralization at thirty gold districts on the Eastern Shore. The purpose of the investigation was to find a unifying reason for gold mineralization. Results of the study show that most of the rocks near or at the gold deposits are affected by large alteration zones. The alteration zones result from fluids that originated with granite intrusions. Another common feature is the intricate and composite nature of the quartz veins. Alteration zones are a

guide for exploration companies and can give clues to areas potentially rich in gold.

In addition geologists mapped and collected samples at the underground gold development projects of several companies. Underground work by Seabright Resources Inc. (Beaver Dam, Halifax County; Forest Hill and Caribou, Guysborough County), and Coxheath Gold Holdings Ltd. (Tangier, Halifax County) provided three dimensional exposures of gold veins with the attendant alteration zones and quartz veins.

Allied with the examination of gold deposits is the study of the effects of heat and pressure (metamorphism) produced by granite intrusions on the surrounding rock units. The purpose of the sub-study is to determine the role of metamorphism in forming gold deposits.

Work on this project has assisted exploration and mining companies understand gold mineralization in Nova Scotia. Detailed results are presented in the *Mines and Minerals Branch, Report of Activities, Parts A and B.*

Mineral Deposits Project

Nova Scotia has a variety of mineral deposits in complex geological environments. Some of these mineral deposits, or potential areas for them, are being studied in the South Mountain Granite Project and Cumberland Basin Project. Other mineral deposits are also being investigated through this project.

This project studies base metals (copper, lead, zinc and related gold and silver) in many different areas of the province. The purpose is to understand how certain deposits formed (for example, the Walton deposit, Hants County, and the Stirling deposit, Richmond County) and how others, not yet discovered, may be defined. It is a co-operative project involving geologists from the Geological Survey of Canada and Dalhousie University, as well as from the Department.

Another part of the project is the study of mineral deposits and occurrences associated with the South Mountain Granite. South of Caledonia, previous mineral exploration work had found boulders containing tin, tungsten, copper, lead and zinc minerals. Gravity surveys suggested that a buried granite was responsible for the visible mineralization. The Department used a diamond core drill to test the buried mineral potential at this site. A hole was drilled to a depth of 681 m, but did not encounter a granite. A study of the core indicated that the rock was highly metamorphosed and contained skarn-type layers, often rich in the tungsten mineral scheelite. More laboratory work is needed.

Geochemistry and Quaternary Geology Section

P.J. Rogers, PhD, Manager

INTRODUCTION

The Geochemistry and Quaternary Geology Section collects and interprets data from the study of glacial deposits and the distribution of elements in soils, streams and rocks. Its mandate is to provide expertise in the study of glacial deposits and geochemistry, and to assist the Division in the development of computer based data collection, retrieval and interpretive software and hardware.

PROJECTS

Three projects are underway. One deals with the collection and interpretation of chemical data. Another project involves the mapping of glacial deposits. The third is the development of computer based data and word processing capabilities. All of this work is directly applicable to the mineral exploration industry because much of the data is needed by these same companies, land use planners and other government agencies.

Geochemical Studies

The goal of this project is to produce an atlas of maps on different scales that shows the distribution of selected elements in lake bottom sediments, stream sediments, and soils and rocks across the province. Such an atlas provides a great incentive for exploration companies to continue looking for mineral deposits in Nova Scotia.

During the 1987 summer, work focused on collecting stream silt samples from the eastern part of northern Nova Scotia and the eastern region of Cape Breton (Fig. 2). More than 1,200 localities were sampled. Data from the chemical analyses of the silt samples will support the completion of a geochemical atlas of the province.

Regional studies such as this allow mineral exploration people to concentrate their resources and effort more efficiently. Instead of broadly looking for minerals, they can use the regional geochemical data to focus their exploration work.

Surficial Deposits Project

Research work on surficial deposits is designed to describe the glacial history of Nova Scotia and the geochemistry of the glacial deposits. By studying how

glaciers have moved, the materials they have transported and the chemistry of the deposits, exploration companies may be able to locate buried mineral deposits.

Field work during 1987 was centred in Pictou, Antigonish and Guysborough Counties. The project was jointly funded by the Geological Survey of Canada (Energy, Mines and Resources Canada) and the Department, through the CNSMDA.

The work's principal purpose was to define and describe the different glacial movements and their deposits in northern Nova Scotia. Additionally, samples of the glacial deposits were taken for chemical analysis. Till in Northern Nova Scotia contains many anomalous values of copper-lead-silver-uranium and other elements. The study of glacial deposits and the movement of glaciers can assist exploration companies in their search for minerals.

Glacial deposits of sand and gravel are the principal reservoir of water for many people in the province and the source of large volumes of sand and gravel (aggregates) used in construction. Work on this project has assisted many government agencies defining potential land use as well as outlining water and aggregate resources.

Most of the province has now been mapped at 1:100 000 or 1:50 000 scale. Cape Breton Island is the next region slated for work.

Data and Word Processing Assistance Project

The purpose of the project is to assist the Mineral Resources Division acquire more convenient and timely access to electronic data processing facilities.

Most of the personal computers now in use are supporting multi-task users including word processing, database and spread sheet analysis. Staff members in the Mineral Resources Division and others have the benefit of tutorial sessions for learning the use of the hardware and software as well as regular user meetings to share experience gained through various applications. The continuing need for exposing as many departmental staff to computers is a major component of the on-going training and information strategy.

MINING ENGINEERING DIVISION

P. W. Phelan, PEng, Director

INTRODUCTION

The Mining Engineering Division is responsible for the administration and regulation of the mining industry in the province on behalf of the Department. The Division provides a diamond drilling service to Department geologists and is responsible for maintaining Department vehicles, as well as the equipment and facilities needed for drilling.

SIGNIFICANT EVENTS IN 1987-88

The Cape Breton Development Corporation commenced production in May, 1987 at the newly developed Phalen Colliery, located near Lingan, Cape Breton County. The Phalen Colliery is a retreat longwall operation extracting coal from the Phalen Seam and is located approximately 150m below the Lingan Colliery workings in the Harbour Seam.

Development work at the Donkin Colliery, Port Morien, was put on indefinite hold following completion of two 3.5 km tunnels and the extraction of a 5000 t bulk sample for metallurgical testing.

The expansion at the Victoria Junction Preparation Plant to process coal from the Phalen Colliery was completed, and increased the annual raw coal capacity from 2.6 million t to 4.0 million t. The introduction of water-only cyclones to treat fine coal, and the installation of vacuum filters in the de-watering circuit, have improved plant productivity and efficiency.

Evans Coal Mines Ltd., St. Rose, Inverness County, incurred a continuous inflow of water (2.7 million L per day) that impeded normal operations. Preliminary investigations suggested that exploration holes drilled in 1919 may be draining water from acquifers into the mine workings. A two-phase project, comprising a dye tracing investigation followed by a grout placement program, will be undertaken to resolve this water problem.

Pioneer Coal Company, Westville, Pictou County, extracted coal from the Acadia Seam by surface mining methods during the year. A coal preparation plant is being installed on site and will be used to process reclaimed coal from the Drummond dumps. The plant will also upgrade production from the Acadia and Scott Seams as required.

Since 1981, Suncor Inc. has held a special license and conducted extensive exploration activities (47 holes plus extensive surface and down hole geophysics)

on the Pictou Coal Field near New Glasgow. In November, 1987 Westray Coal Inc. made a proposal to purchase the Suncor property and develop a mine to extract coal from the Foord Seam. Westray announced that it is investigating the feasibility of developing an underground mine and coal preparation plant with an annual capacity of one million t.

The open pit tin mine, concentrator and associated facilities owned by the East Kemptville Tin Corporation at East Kemptville, Yarmouth County, were repurchased by Rio Algom Ltd. in March, 1988 from the consortium of banks who had financed the project when it was originally constructed by Rio Algom. The operation has been renamed Rio Kemptville Tin Corporation. An aggressive research program and the installation of additional process equipment have improved mineral recovery.

Several potential gold producers in the province have advanced their exploration programs to a bulk sample stage, having received sufficiently encouraging results from exploratory diamond drilling work. Permission to extract bulk samples was given to:

1. Westminer Canada Ltd. (formerly Seabright Resources) for the Beaver Dam, Forest Hill, Caribou and Moose River properties;
2. NovaGold Resources Ltd. for the Fifteen Mile Stream property;
3. Coxheath Gold Holdings Ltd. for the Tangier property;
4. Onitap Resources Inc. (optioned to Exploration Orex Inc.) for the Goldboro property;
5. Acadia Mineral Ventures Ltd. (optioned to Hecla Minerals) for the Mooseland property.

No mining leases have been issued to potential gold producers in the province; however, three mill licenses were issued to process gold at the following locations:

1. Coxheath Gold Holdings Ltd. for the Tangier Property;
2. Westminer Canada Ltd. for the Gays River Mill; and
3. NovaGold Resources Ltd. for the Cochrane Hill property.

Illegal coal mining in Cape Breton continues to be a problem. Several charges of illegal mining were laid by the RCMP and subsequent convictions were achieved.

Mining Engineering Section

D. S. Jones, PhD, PEng, Manager

The Mining Engineering Section is responsible for ensuring that the province's mineral and energy resources are utilized to their optimum, and that mining operations are conducted in a safe, efficient and environmentally acceptable manner.

This includes reviewing proposals from industry for new mining projects or modifications to existing mines, and making recommendations for issuing mining leases and permits. The Section also provides technical advice and assistance to industry and government on mining problems, and conducts economic and feasibility studies for new mineral projects.

Drill and Mechanical Section

D. MacNeil, Manager

The Drill and Mechanical Section is responsible for operating the Department's diamond drills and maintaining all vehicles and mechanical equipment.

The amount of drilling completed by the Department during the last several years is shown in Table 1. Details of drilling during the fiscal year 1987/88 are given in Table 2. Further information about individual holes is provided by the annual publication *Drill Logs of Government Core Drills.*

TABLE 1. Annual drilling statistics

Fiscal Year	Number of Holes	Amount Drilled Feet	Metres
1983-84	76	19,862	6 054
1984-85	27	17,434	5 314
1985-86	14	20,538	6 260
1986-87	61	19,203	5 853
1987-88	38	17,623	5 371

TABLE 2. Departmental drill holes completed during fiscal year 1987-88

Site Name	Map Reference	D.D.H. Designation	Drilled Feet	Drilled Metres
Springhill	21-H-9D	SHP87-1/2	555.8	169.4
Ten Mile Lake	11-E-2	TML87-1	3613.2	1101.3
Margaree	11-K-7C	FFB87-0/1	307.1	93.6
Chegoggin Lake	20-0-16A & 20-0-16D	CHEG87-1 to 9	3554.1	1083.3
Caledonia	21-A-6A	HIB87-1	2205.4	672.2
Coalburn	11-E-10A	P59	3312.3	1009.6
Salmon River	11-F-16B	413 to 421	1119.1	341.1
Terence Bay	11-D-5D	TB87-1 to 12	1021.0	311.2
New Campbellton	1-K-08A	NC87-1	1935.0	589.8
		TOTAL	17,623.0	5371.5

MINERAL DEVELOPMENT DIVISION

D. A. Murray, MSc, Director

The Mineral Development Division is divided into two sections, the Resource Geology Section and the Mineral and Petroleum Titles Section. The responsibilities of the Division lie in the orderly development and promotion of the province's mineral resources. Included in these responsibilities are mineral resource regulations, mineral titles policies and assistance in the promotion and development of all minerals. It also maintains geological information through the departmental libraries and drill core library. The Division monitors mineral production and mineral exploration activity in the province and provides liaison among mineral producers, the exploration research establishments, landowners and government agencies. The division also collects and compiles mineral production and exploration statistics.

Projects carried out under the CNSMDA have identified a number of new mineral opportunities. This agreement has also provided partial funding to the industry through the Mineral Investment Stimulation Program (MISP) for development projects. A new core library building was built during this period in the Stellarton Industrial Park.

Mineral and Petroleum Titles Registry

R. Ratcliffe
Registrar of Mineral and Petroleum Titles

The Mineral and Petroleum Titles Registry is responsible for receiving applications for mineral and petroleum rights and for issuing and registering the licenses or leases. In addition, any documents affecting licenses, such as transfers of title, assignments of interest, option agreements, special licenses and exploration agreements, are registered by this office. The Registry also receives all statements of exploration expenditures and assessment reports that pertain to the renewal of licenses and leases. Maps showing the disposition of lands under license or lease are maintained and continually updated. These maps are available for a nominal charge. Applications for underground gas storage rights and treasure trove licenses are also processed through this office. Information concerning production and employment in Nova Scotia's mines and quarries is received and tabulated by the Registry and published annually by the Department.

A large number of inquiries from industry, the public and other government departments are answered each year. Most deal with general questions and procedures for obtaining licenses, information on past exploration and mining activities, and statistical information on production for operating properties. The

Registry is responsible for all fees, bonds and other monies due for licenses, leases, statutory work deposits and payments in lieu of work as well as the sale of claims reference maps and copies of legislation from the Halifax office library.

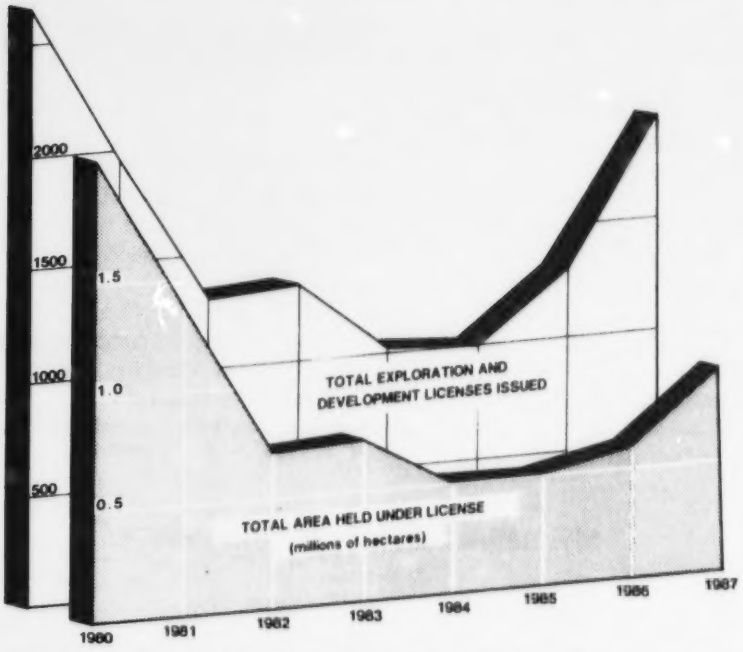


FIGURE 3. Trends in mineral exploration and development.

The Registry maintained a high level of activity in 1987 (Table 3). For example, 1,465 exploration and development licenses (Fig. 3) were issued to 239 licensees for a total of 53,516 claims or 866 305 ha (2,140,640 acres). Seventy-nine transfers were processed and 31 agreements received. Figure 3 compares trends in mineral exploration and development. During 1987, a record total of $26,713,524 in assessment work was reported to have been conducted in the province (Table 3). A comparison of exploration expenditures is shown in Figure 4. In support of this reported work, 238 assessment reports were received in 1987. As well, Registry staff participated in the review of the *Mineral Resources Act.*

The Regulations under the *Petroleum Resources Act* were brought into force in October of 1985. In total, four exploration agreements were maintained in 1987 by three companies for 3 582 255 acres (1 449 170 ha).

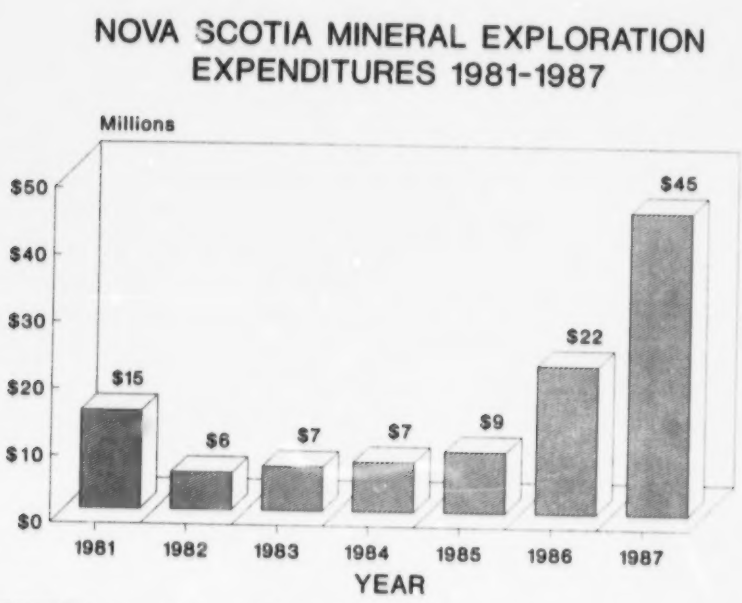


FIGURE 4. Trend in expenditures for mineral exploration.

During the winter of 1987, the Registry participated in the Training and Employment Initiative Program for disabled persons by employing an individual to assist in automating the Registry system. The automated titles system should be in full use during 1988.

Resource Geology Section

J. M. Bingley, BSc, Manager

INTRODUCTION

The Resource Geology Section of the Mineral Development Division works with industry, educational institutions, other government agencies and the public to promote a strong mineral industry and to provide geological and geostatistical information and services. The personnel resource to perform these functions consists of geologists, biologists, planners, technicians, librarians and secretaries; sixteen of whom are situated in the Halifax office and eight in the Stellarton office. An additional six or more student assistants and casual employees are hired for the summer months and to provide peak-time assistance. The projects these professionals manage, and their locations, are shown in Figure 5.

TABLE 3. Mineral exploration trends in Nova Scotia.

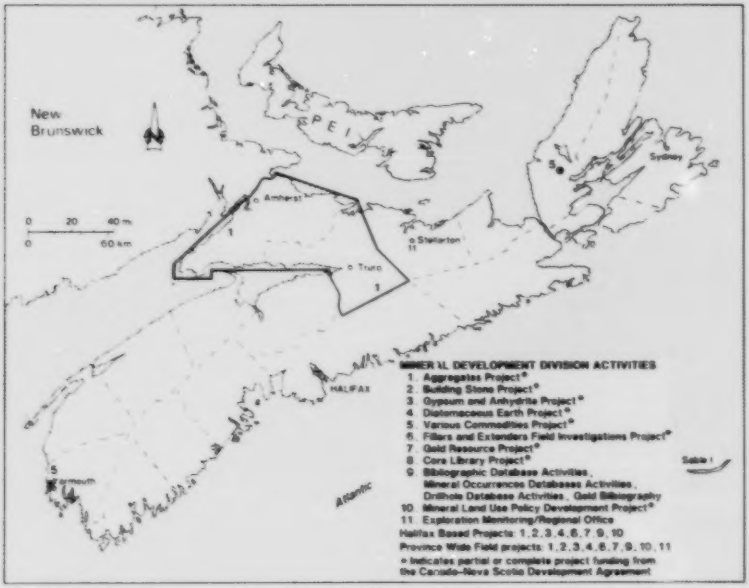
		1980	1981	1982	1983	1984	1985	1986	1987
SUMMARY (onshore)									
Value of Reported Assessment Work		$7,564,000	$ 8,441,270	$4,100,000	$4,200,000	$2,625,666	$2,389,351	$ 9,954,014	$26,713,524
Exploration Expenditure		—	$14,608,000	$5,553,000	$7,000,000	$7,300,000[1]	$8,000,000	20,000,000[1]	45,000,000[1]
Total Licences Issued		2,559	1,952	1,298	1,350	1,039	1,025	1,306	1,965
CLAIMS RECORDED ONSHORE[2]									
Base Metal	claims	88,703	68,863	39,626	40,630	26,627	27,809	36,714	53,516
	acres	3,548,120	2,754,520	1,585,040	1,585,040	1,065,080	1,112,360	1,468,560	2,140,640
	hectares	1 435 904	1 114 739	648 871	657 709	431 032	450 166	594 318	866 305
Uranium	claims	25,483	6,225	—[3]	—[3]	—[3]	—	—[3]	—[3]
	acres	1,019,320	249,000	—	—	—	—	—	—
	hectares	412 513	100 769	—	—	—	—	—	—
Salt, Potash	claims	13,505	5,225	1,065	505	1,257	830	192	—
acres	540,200	209,000	42,600	20,200	50,280	33,200	7,680	—	
hectares	218 616	84 581	17 240	8 175	20 348	13 436	3 108	—	
Coal	claims	—	4,880	3,072	4,565	3,584	3,584	482	1,682
	acres	—	195,199	122,880	182,599	143,360	143,360	19,280	67,280
	hectares	—	78 996	49 729	73 897	58 017	58 017	7 803	27,228

Number of Mineral Assessment Reports		140	150	124	188	127	108	154	238
Total Areas Held Under Licence	acres	5,107,640	3,212,520	1,627,640	1,827,999	1,258,720	1,288,920	1,495,520	2,207,920
	hectares	2 067 033	1 379 085	709 219	739 781	509 397	521 619	605,229	893,533

PETROLEUM LICENCES ISSUED

Land Areas	licences	52	99	68	93	106[4]	—	3	4
	acres	4,284,909	6,230,046	5,419,952	8,048,306	8,567,791[4]	—	3,996,026	3,582,255
	hectares	1 734 079	2 521 265	2 193 424	3 257 104	3 467 338[4]	—	1 617 170	1,449,719
Submarine Areas	licences	151	172	168	—	—	—	—	—
	acres	31,589,070	34,786,199	33,965,867	—	—	—	—	—
	hectares	12 783 921	14 077 781	13 745 798	—	—	—	—	—

[1]estimate from Nova Scotia Department of Mines and Energy sources
[2]claims are 40 acres or 16.2 ha each
[3]uranium exploration and mining moratorium in effect
[4]as of July 1, 1984


New Brunswick
P.E.I.
Amherst
Truro
Stellarton
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HALIFAX
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MINER'AL DEVELOPMENT DIVISION ACTIVITIES
1. Aggregates Project*
2. Building Stone Project*
3. Gypsum and Anhydrite Project*
4. Diatomaceous Earth Project*
5. Various Commodities Project*
6. Fillers and Extenders Field Investigations Project*
7. Gold Resource Project*
8. Core Library Project*
9. Bibliographic Database Activities, Mineral Occurrences Database Activities, Drillhole Database Activities, Gold Bibliography
10. Mineral Land Use Policy Development Project*
11. Exploration Monitoring/Regional Office
Halifax Based Projects: 1, 2, 3, 4, 6, 7, 9, 10
Province Wide Field projects: 1, 2, 3, 4, 6, 7, 9, 10, 11
* Indicates partial or complete project funding from the Canada-Nova Scotia Development Agreement

FIGURE 5. Project locations of Mineral Development Division.

Two Mineral Development Agreement Projects, the Fillers and Extenders Project and the Diatomite Project, were completed at the end of fiscal year 1987-88. A third, the Gold Inventory Project, was not completed; the project geologist in charge took alternate employment in industry. Final open file reports for all three projects will be available in late 1988.

HALIFAX OFFICE ACTIVITIES

The Halifax staff of the Resource Geology Section is located on the third floor of the Founders Square Building, 1701 Hollis Street, together with the Registry of Mineral and Petroleum Titles.

Functions and services provided by the Halifax office are:

- maintenance of the departmental library, which consists of extensive geological, mining and energy-related materials and is open to the public
- industrial minerals research (Building Stone, Diatomite, Fillers, Aggregates, Various Commodities and Gypsum/Anhydrite Projects) and assistance to industry

- compilation and publication of various mineral inventory type databases (GEOSCAN, drillholes, gold bibliography, mineral inventory, etc.)
- compilation of databases and maps for the Land Use Policy Development Project
- compilation of field data and information for the Gold Inventory Project

INDUSTRIAL MINERAL PROJECTS

Financial support for six industrial mineral resource projects comes from the Mineral Development Program of the CNSMDA.

The objective of these studies is to create an awareness of the province's industrial mineral resources and to promote resource development and production diversification. Projects underway will:

- identify and promote the development of the province's building stone resources
- document the gypsum and anhydrite resources
- map the aggregate resources in selected regions
- evaluate the province's diatomite resource
- identify the mineral filler and extender resources in Nova Scotia
- identify other industrial mineral deposits currently sought after in the market place

Building Stone Project

Introduction The use of natural stone in building construction is increasing in the major industrialized nations of the western world. The two reasons for this trend are reported to be reduced costs of finished stone products due to improvements in cutting and polishing technology, and the tendency of architects to use combinations of brick, natural stone and glass instead of steel and glass exteriors. In response to the increasing demand for information on building stone deposits, the Building Stone Project, funded under the CNSMDA was initiated in September, 1985 as a five-year program to identify and evaluate such deposits in Nova Scotia. Two years of field work have been completed with positive results (Fig. 1).

During fiscal year 1987-88, two sandstone deposits were evaluated in Pictou County for production of construction stone; one granite deposit in Halifax County was core drilled and bulk sampled for the production of various granite products; and several granite deposits on tide water have been evaluated for crushed stone potential. Promotional information on stone deposits and a sample catalogue are being prepared.

Sandstone Deposits. In response to increased demand for Nova Scotia sandstone products, several deposits have been evaluated by core drilling.

The red sandstone deposit at Amherst in Cumberland County was core drilled in 1986 and an open reserve of 970 000 ft^3 (27 000 m^3) of high quality stone was outlined. The reserve of olive green and blue sandstone at the Wallace Quarry in Cumberland County was extended to 350 000 ft^3 (10 000 m^3) and 116 000 ft^3 (3300 m^3) respectively. In 1987, overburden stripping by the quarry operator was begun in preparation for quarrying in the summer of 1988. In Pictou County, a deposit of 80 000 ft^3 (23 000m^3) of grey sandstone was outlined at Eight Mile Brook and 91 000 ft^3 (2600 m^3) of brown sandstone was drilled at Sawmill Brook.

A sandstone deposit located at Hardwood Hill, Pictou County was evaluated for use in construction of the common user dock for the town of Pictou. A new quarry was opened at this site in July, 1987.

The old McKeen Quarry (English Property) near the town of Pictou was evaluated as a potential source of stone for the P.E.I. market. Although the material is marginal for such a purpose, significant tonnage of sandstone suitable for building stone may be present.

Granite Deposits. Field work in 1987 concentrated on locating granite deposits suitable for building stone. To date, approximately 12 old quarries and new sites have been evaluated. The Terence Bay deposit was core drilled and a new quarry site has been identified.

A total of 12 holes, for a total of 311 m at three sites, tested the granite. The most northerly site was considered the best suited for building stone production due to its proximity to a highway. There, a total of 7.9 million ft^3 (223 000 m^3) of granite to a depth of 40 ft (13.7 m) was outlined. The resource is considered to be open in all directions.

In addition, five large granite blocks were taken from the deposit for the preparation of full size specimens of cladding panels, street curbing and a finished monument. The results of this work indicate that the Terence Bay stone has excellent characteristics for use as building stone.

Potential Crushed Stone Deposits. Five areas, chiefly underlain by granite rocks, have been identified as potential crushed stone deposits located on 12 m minimum tidewater. The sites are Kelly Cove, Victoria County; White Point, Victoria County; Flagstaff Hill, Guysborough County; Sheet Harbour, Halifax County (quartzite); and Terence Bay, Halifax County. Additional information will be supplied on these deposits in a separate open file release.

Promotional Material. A preliminary report on the sandstone of Nova Scotia is in progress and will be available in 1988. A sample catalogue and brochure is being prepared and will be completed in 1988. The catalogue will include sandstone, granite, marble and slate rock specimens, and information about specific deposits and test results in a format to which additions can be made as new deposits are identified.

Gypsum/Anhydrite Project

The Gypsum/Anhydrite Project was initiated in June, 1985 through the CNSMDA to produce an inventory of the gypsum and anhydrite resources. Three project goals have been established. The primary goal is to produce a comprehensive mineral inventory. The second is to increase and enhance relations between the Department and the province's present producers, and the third is to initiate and encourage development of alternate utilization of Nova Scotia's gypsum and anhydrite resources.

During the 1987 field season, gypsum occurrences in Inverness, Richmond and Victoria Counties on Cape Breton Island, and in Antigonish, Colchester, Halifax, Hants and Pictou Counties on the mainland were mapped and sampled. A total of 248 samples were taken from the occurrences and they were analyzed for gypsum, anhydrite and salt content. In addition, selected drill cores, stored at the core library in Stellarton, were logged and sampled. These were chosen from various areas around the province for their good sulphate horizons, and the 652 samples taken will contribute significantly to the subsurface data available on many occurrences. To date, 158 separate gypsum/anhydrite occurrences have been investigated.

Results of a small drilling program which was carried out in 1986 will soon be released in an open file report. Although limited in scope, the study was able to determine that both gypsum and anhydrite horizons of high purity, having gentle dips and lateral extend, can be found in the Meadows Road area.

Fifteen requests for information and/or samples were received during 1987-88. These included two from the province's present producers. Inquiries ranged from stratigraphic information to resource potential for quarrying and finished production sites.

Investigations, funded by the Canadian Centre for Minerals Technology (CANMET), into the utilization of local anhydrite in coal mine gateside packs were carried out by the Technical University of Nova Scotia (TUNS) in 1987-88. Anhydrite from Nova Scotia was able to perform in a fashion similar to those anhydrites which have been used in West Germany for over 15 years. In conjunction with these efforts, a trip was made to production and utilization

locations in the Ruhr Valley area of West Germany. Information gathered on this trip was of much assistance to the studies at TUNS.

Aggregate Resource Project

Introduction Assessment of the aggregate resource in northern Nova Scotia continued during 1987, with approximately 90 per cent of the work being completed at year end. The project consisted of an evaluation of all aggregate potential in Cumberland and Colchester Counties. The decision to examine this region was based primarily on the local absence or depletion of high-quality materials as well as the competition that exists for resource land use.

Objectives and Methods The primary objectives of the study are to outline the granular deposits; to search for bedrock lithologies suitable for crushed stone production; to examine the potential of alternate materials; and to assess the quality of the resource throughout the region. Achievement of these goals is being accomplished by detailed surficial mapping, airphoto interpretation and a comprehensive sampling program.

Summary of Results The study's results indicate the presence of several previously unidentified granular aggregate deposits, including glacio-fluvial, glacio-marine and modern alluvial sediments. Many of these materials are of good quality, with some found in areas where there are currently supply shortages. In addition to the sediment-derived granular deposits, there are abundant occurrences of weathered bedrock materials. Some of the weathered conglomerates have good clast composition and may represent an alternative to more conventional types of aggregate supplies in some regions.

During the year, approximately 120 samples were collected and analyzed for their suitability as asphalt and concrete grade aggregate.

The remaining field work, sampling and data compilation will be completed in the summer of 1988. Upon completion of the study, a report and maps will be produced.

Diatomite Project

Introduction Diatomite or diatomaceous earth is a siliceous sedimentary mineral commonly found in lakes and bogs in the upper reaches of many watersheds throughout Nova Scotia. It has been formed by accumulation of skeletal remains of shells, from tiny one-celled plants known as diatoms. Essentially composed of hydrous silica ($SiO_2.n.H_2O$), it is characterized by a low specific gravity, large surface area/volume ratio and high porosity; properties which make it valuable as a filter aid and as functional filler in a wide variety of products.

Most diatomite is used as a filter-aid in the food processing industry to clarify beer, wine and juices as well as vinegar, sugars, oils and fats. As a functional filler, diatomite is used primarily in the manufacture of paint and plastics as well as a chemical carrier, pozzolan and abrasive.

Activities 1987 Fiscal Year The diatomite project consisted of a library research component and a field/laboratory investigation component for significant deposits. All phases of this project were completed in 1987, except for an open file report that is being prepared for release in late 1988.

Fillers and Extenders

The Fillers and Extenders Project, initiated in 1986 to determine the domestic and international market potential for filler minerals indigenous to Nova Scotia, has been completed.

Mineral fillers are generally inert, finely ground mineral substances that are incorporated into the manufacturing of various products. They primarily serve to reduce the consumption of more expensive raw materials, such as plastic resin or rubber. Extenders enhance the final products usefulness by introducing some new property or properties.

The first phase of the project was to identify local industrial users of filler minerals and to compile information on the international filler market. The second phase was to locate and analyze potential sources of filler grade materials within the province. An open file report is in preparation for release in late 1988.

Various Commodities Project

The Various Commodities Project progressed through its second year of updating and improving the database on several industrial mineral commodities. These commodities include andalusite, barite, beryl, brucite, dolomite, garnet, graphite, limestone, manganese, silica, spodumene, talc, topaz and wollastonite.

After an initial period of data compilation and field investigations, certain deposits were selected for more detailed work.

A project was undertaken during 1987 to calculate ore reserves and to define the extension of the silica and garnet deposit at Chegoggin Point, Yarmouth County. The program involved data compilation of all previous work, a geophysical program and a nine-hole diamond drilling program to determine the orientation and extension of the deposit. A mineable reserve in excess of 10 million tonnes of high grade silica has been outlined at Chegoggin Point. Several

infill drill holes between previous holes have indicated that the deposit is not a continuous bed from Chegoggin Point to Lake George, but is displaced and/or discontinuous over this distance. There are, however, lenses of high-grade, mineable silica ore in sections but additional work is required to better define the extend and orientation of these blocks. A bulk sample was taken from the garnet rich bed adjacent to the silica one at Chegoggin Point and is presently undergoing metallurgical testing.

Work continued on several limestone/dolomite deposits throughout the province; Lafarge Canada Ltd. completed geophysical and diamond drilling programs, and began using new sources of limestone at its Brookfield plant. Increased interest has also focused on the large deposits of Cape Breton Island, with development currently underway at Kelly Cove and other deposits undergoing exploration.

Initial work has been completed on the titanium sands at South Maitland, Hants County and talc occurrences in Cape Breton.

A diamond drilling program is underway on the limestone deposit in Glencoe, Inverness County to better define portions of the deposit for use as fillers and extenders as well as to to explore previously undrilled sections. Field work is being completed on other Cape Breton deposits of limestone/dolomite, silica, brucite and barite.

METALLIC MINERALS

Gold Resource Inventory Project

The field and library research component of this CNSMDA project was concluded in May, 1987.

Consultant geologist/editor Katherine Mills was retained on a part-time basis beginning in March, 1988, to prepare project geologist Craig Miller's draft report as an open file release.

LAND USE POLICY DEVELOPMENT

Through the CNSMDA, the Department is attempting to generate better understanding of Nova Scotia's mineral and energy resources to industry, the public and other provincial government departments. The Land Use Policy Development Project has been developed to channel mineral resource information to the provincial and municipal planning community.

The overall objective of the project is to promote proper management and protection of our mineral resources by providing information, improved communication and resource management guidance to all land use managers.

A three-phased approach has been defined to implement the objectives:

Phase one:	Information gathering and creation of MINLU — a mineral land use information base. Products include a series of 18 Mineral Resource Land Use (MRLU) maps and handbooks.
Phase two:	Mineral potential mapping covering Nova Scotia.
Phase three:	Land use policy recommendations concerning mineral, aggregate and energy lands. Groundwork will be laid for the adoption of provincial land use policy in accordance with section 7 of the Planning Act.

Survey on mineral resources and land use

A questionnaire was distributed to Nova Scotia's municipal planners this year, to gather information on the interaction between mineral-based activity and land use planning. The questionnaire was designed to solicit information on the current level of land use planning activity in Nova Scotia, the types of municipal permit and fee structures required for resource extraction, the perceived availability of mineral resource information by planners, and the types of land use issues planners encounter that are caused by mineral-based activity or by naturally occurring geological hazards.

Preliminary results show that a great deal of land use planning is taking place in Nova Scotia. More than 60 per cent of the province's municipal units have plans and land use by-laws in place. A high level of planning activity is assured in that municipal plan reviews are ongoing in many of the larger municipalities, and over 75 per cent of smaller municipalities with land use plans have review dates within the next four years. A majority of the respondents indicated that detailed inventories of mineral, aggregate and coal resources created by provincial programs were very important and useful to the planning process. Similarly, most respondents thought that the province should give direction to planners by identifying mineral-related resources that need to be protected against potential land use conflicts. The most sought after information includes: the environmental effects of resource extractions; locations of mines, quarries and pits; provincial responsibilities over exploration and mining; mineral resource potential; locations of abandoned mine shafts; locations of mineral occurrences; ground subsidence; extent of proven underground coal resources and drill hole locations.

The Land Use Policy Development Project is working to provide planners in Nova Scotia's municipalities with mineral resource land use mapping and other materials to assist in the land use planning process.

Mineral Resource Land Use Mapping

Mineral Resource Land Use Maps have been compiled and released for Halifax County (OFM's 88-01 to 88-12). Hants County (OFM's 88-17 to 88-22) maps have been compiled and are due for release in July 1988. Compilation is now being done on a seven map set of Cape Breton County.

Additional Projects

Aquaculture The staff of the Land Use Planning Project has the additional responsibility of reviewing applications for aquaculture licenses and experimental permits. This review process allows the department to screen proposed aquaculture sites for potential conflict with mineral-based activities.

Mineral Resources and Planning The Land Use Group receives requests for mineral resource information from planners and planning consultants. Several reports and maps with current mineral resource information have been prepared in response to these requests.

Provincial Planning The Land Use Group also contributes to the interdepartmental committee on land use, and the group is active on Voluntary Planning's Land Resources Co-ordinating Committee. Staff also records and monitors changing land use in the province, such as the designations of ecological reserves and surface watersupply watersheds.

Public Information Members of the Land Use Planning Project and the CNSMDA's Public Information Program are combining resources to produce a Mineral Resource Atlas and a catalogue of films on mining and energy projects for Nova Scotia.

LIBRARY SERVICES

The Department maintains two technical libraries. A main library is located in the Halifax office with a branch library in Stellarton. Holdings include more than 7000 maps, 4200 exploration assessment reports, 800 open file reports, 950 open file maps, 600 theses, 200 different periodicals, journals and trade magazines, and numerous reference texts and other documents. The libraries function as important resource centres for information on the geology, energy resources and mining history of Nova Scotia. To this end, the libraries provide the following services and facilities:

- reference and information service to the general public, provincial government personnel, professional geoscientists, engineers and consultants in private industry
- sale of departmental and Geological Survey of Canada publications and maps
- catalogued and classified files of library holdings, including exploration assessment reports, open file reports, open file maps and theses
- a mailing list of individuals, institutions and corporations that wish to be informed of the Department's activities and publication releases
- facilities for photocopying, microfiche reading and printing and for making white print duplicates of maps
- sale of federally and provincially published topographic maps (Stellarton only)

The main library in the Halifax office continued to be busy, with an increased demand for information services and products during fiscal year 1987-88. The acquisition of energy-related books, plus the increase in mineral exploration activity in Nova Scotia, led to an increase in the workload at the main library. As a result, another full-time librarian was hired in September, 1987. More than 2000 people (excluding staff) made use of the library facilities. In addition, 900 telephone inquiries and 1000 mail inquiries were answered.

Revenue from the sale of more than 2500 maps, 9000 pages of photocopying, 7500 pages of microfiche prints and 2100 white prints totalled $23,073; sale of departmental publications generated $10,293. More than 6000 publication release notices and over 750 annual reports were mailed out, as well as 600 announcements for the annual open house. More than 350 interlibrary loans were processed and over 350 orders for books and supplies were placed.

MINERAL INVENTORY

The Mineral Inventory Group is responsible for the collection, verification, organization and dissemination of mineral resources information. The main functions of the group are threefold: to verify that submitted exploration assessment reports comply with the Rules and Regulations of the Mineral Resources Act, for the purpose of renewing exploration licenses; to establish and maintain databases of mineral resources information; and to publish pertinent compilations of mineral resources information for use by the Department, other government agencies, the mineral exploration industry and the general public.

As a result of funds obtained from the Department, the CNSMDA and the 1987 Provincial Summer Employment Program, four major projects involving six people were in operation during fiscal year 1987-88. These projects were GEOSCAN Bibliographic Database, Mineral Occurrences Databases, Drill Holes Database and the Gold Bibliography.

Bibliographic Database

Indexing and on-line data entry into GEOSCAN, the national bibliographic database for geological information, continued during fiscal year 1987-1988 for the Department's assessment reports, publications, open file reports, open file maps, geoscience theses and journal literature references. *Report 86-4 Index to Publcations, Open File Reports, Open File Maps and Theses 1981-1985* was published in February 1988, and *Report 87-3 Index to Assessment Reports, Publications, Open File Reports and Open File Maps for 1986* was published in November 1987.

Throughout the summer and fall of 1987, a project developed to index all available onshore and offshore petroleum assessment reports on Nova Scotia not previously indexed. A total of 84 indexed onshore reports will be available to the public on microfiche when the confidentiality periods expire within the next five years. Microfiche copies of reports on 108 offshore wells, ordered from the Canadian Oil and Gas Lands Administration (COGLA) in Ottawa, are available for consultation in the Department's Halifax library.

In fiscal year 1987-88, 674 new Department records were added to GEOSCAN. They consisted of 122 assessment reports, 211 publications, 147 journal literature references, 55 open file reports and 139 open file maps. By the end of the fiscal year, GEOSCAN contained 9736 Department records, consisting of the following:

Assessment Reports	—	4 138
Publications	—	1 995
Journal References	—	1 251
Open File Reports	—	802
Theses	—	597
Open File Maps	—	953

To improve the Metallic Mineral Occurrences Database, a program of systematic reference researching and checking, coupled with selected field checking, was initiated in 1987.

Two hundred and sixty-five metallic mineral occurrences references were researched and checked. Reference checking and revisions have now been completed for the following map sheets: 11E/04, 06, 07, 08, 09, 10, 11, 14, 15 and 16; 11F/05, 12 and 16; 20O/09 and 16; and 21A/10.

Drill Holes Database Project

A project was initiated in the summer of 1986 to add all the drill holes reported in the NSDME publications *Drilling Logs of Government Core Drills*, available

from 1901 to 1985, to the database. Approximately 6 000 drill holes were coded and entered into the database, extending from 1985 back to 1957. The Drill holes Database presently contains 17 214 drill hole records, consisting of approximately six megabytes of data. The database is presently running on dBASE III PLUS and copies of database portions (by map sheet), or custom searches, can be obtained on diskette upon request.

Gold Bibliography Project

Report 87-2, Gold in Nova Scotia: a Bibliography of the Geology, and Exploration and Mining Histories from 1832 to 1986 was published in November 1987. The bibliography contains more than 1300 references, documenting over 300 gold districts and occurrences. It is organized into three parts: part one is an alphabetical author index; part two is an index by gold occurrence, with each subdivided into an author index, an assessment reports index and a map and cross-section index; and part three contains cross-reference lists by gold occurrence, claims reference map, county, status, metallic mineral occurrence card number and production figures.

MINERAL INVESTMENT STIMULATION PROGRAM (MISP)

Introduction

The Mineral Investment Stimulation Program (MISP) is the jointly funded federal/provincial vehicle designed to financially assist the mining industry's private sector develop or improve viable operations.

MISP Assistance is available for approved projects up to a maximum of $50,000 per project. Funding is shared with the private sector on a "dollar for dollar" basis. The maximum contribution from MISP would, therefore, be met with an equal commitment of $50,000 from a qualified individual or company.

Approved projects serve such purposes as detailing established ore reserves, applying innovative processing techniques and investigating new marketing opportunities.

Procedure Each MISP application is assessed by a panel of appropriate experts drawn from the Department of Mines and Energy and Energy, Mines and Resources Canada. Once a project has received approval, the applicant enters into a legal agreement with the province and the initial cash contribution is made.

Thereafter, the recipient submits interim and final reports, together with documentation of expenditures, to receive two further payments.

Benefits The financial assistance extended under the program contributes revenue for the service industries in the short term, and increased employment in the long term. Additionally, the program should create new domestic and export markets with all the attendant long term benefits.

Current Status Thirty-five projects have received approval since the program's inception in October, 1985. Five of these, however, were not initiated for various reasons. A total of $1.18 million has been committed to assist these projects. To date, 15 have met with an encouraging degree of success and the six completed in the year under review are described in the attached status report. Approximately $400,000 is budgeted for MISP's remaining year of operation.

STELLARTON OFFICE

Part of the Resource Geology Section shares a regional office with three other Divisions in the Department's building at 32 Bridge Avenue, Stellarton, Pictou County.

Responsibilities and activities performed by the Regional Exploration Services Group include: liaison with, and monitoring of, the mineral exploration industry; annual surveys of all mining and exploration companies active in the province for statistical compilations of exploration, development, capital expenditures and drilling activity; supervision and operation of the drill-core library; in-house technical support services and expediting; field equipment storage and maintenance; storage of geotechnical samples; library services, including storage of assessment reports and other geotechnical data; storage, distribution and sales of departmental publications and maps, and sales of maps for Maritime Resource Management Services and Energy, Mines and Resources Canada.

Regular permanent staff consists of two geologists, one mineral technologist, one mineral technician and a stenographer/librarian. Term staff employed under the CNSMDA Core Library Program consists of a geologist and a mineral technician.

Exploration Monitoring

The Exploration Monitoring Program acts as a direct liaison with industry through continuous contact with industry personnel, by way of regular visits to company offices and exploration sites, and by telephone contact. In addition, the monitoring staff reviews assessments and other reports submitted by industry and carries out an annual survey of all producers and exploration companies. The survey provides data on actual expenditures made for exploration, development, capital improvements and repairs in all sectors of the mining industry. As a result

of these activities, the Department is able to maintain an awareness of current exploration and development throughout the province and is able to identify and respond to problems and difficulties as they arise.

Drill Core Library

The Department's drill core library exists to preserve valuable drill core resulting from exploration and geological investigations. These are carried out by both the Department and the mining industry. Access is provided to departmental staff, industry geologists, academics and others who strive for the continued understanding and development of the province's mineral resources.

The core library facilities consist of four buildings in the Stellarton Industrial Park; one building in the Debert Industrial Park, Colchester County; one building near Malagawatch, Inverness County; and sheds and core racks at the Department's building on Bridge Avenue in Stellarton. Only the main facility, at the Stellarton Industrial Park, is staffed on a full-time basis by permanent staff (one mineral technologist). A major new addition to this facility was constructed in 1987 through CNSMDA funding. The new building, the fourth at this location, is of similar dimensions and style to those built in 1982-1983, but has significantly improved laboratory and office facilities. One-quarter of the building's floor space is a laboratory consisting of a heated and well-lighted core examination area which incorporates a sound-insulated rock cutting room for diamond saws. Office space for staff and clean storage rooms are situated immediately above the laboratory area.

Most of the core at the main library is stored on pallets and is handled by means of a propane-powered, 1 245 kg capacity fork-lift truck. A complete set of microfiche, the Department's entire collection of non-confidential assessment reports, is available to provide visitors and staff with the ability to research core data.

A geologist and a mineral technician are engaged in a core reduction program through the CNSMDA. The purpose of this program is to systematically discard surplus core by a process of detailed examination and evaluation on the basis of deterioration, previous excessive sampling, repetition, demand and general suitability for retention. Details of the evaluation are documented, and recommendations for disposals are circulated to interested parties prior to any physical disposal. Work during this fiscal year consisted of completing a detailed evaluation of 15 000-20 000 m of core from the former Magcobar-Dresser barite-base metals-silver mine at Walton, Hants County. A similar program is in progress on a large 15 000 m collection of core donated to the Department in 1983 by Kaiser Celestite from several properties on Cape Breton Island.

During the 1987-88 fiscal year, 16 149 m of drill core from 198 holes drilled during the years 1971 to 1988 were received for inclusion in the core library collection; of which 5644 m (35%) were from 11 departmental drilling projects, totalling 43 holes (22%). The balance, 10 505 m of core from 155 holes, was due to mining company activity. A detailed listing of core received is shown in Table 4. Complete information about core received and on hand at the different locations is available at the core library.

Currently, the core library facilities (all locations) contain approximately 443 000 m of drill core.

Technical Support Services

One mineral technician was employed on a full-time basis to provide expediting services. These services included delivery of equipment to, and setting up of, field camps for field geological parties and drill crews; transportation of samples, equipment and furniture between Halifax, Debert and Stellarton; collection of drill core from departmental drilling projects and exploration sites; and delivery, set-up and manning of departmental displays for public functions.

Sample Storage Sample material acquired from field mapping, investigations and geochemical surveys has grown in volume at a rapid rate in recent years. Stored material consists of rock hand specimens, cut slabs, vials of powders, bags of till, recent sediment and coal samples as well as samples of building stone in large blocks and bulk samples of industrial minerals. Vials of chip samples from offshore petroleum exploratory wells are also stored.

A reassessment of all sample storage criteria has begun. Standarized procedures for storage at the Debert facility are being planned.

Publications and Map Storage The majority of the available departmental publications and maps are stored in the Stellarton office. Distribution to the Halifax office and the Nova Scotia Bookstore is made upon request.

Map and Publications Sales The Stellarton office library sells topographical maps produced by Maritime Resources Management Services; topographical, geological and airborne geophysical maps and geological reports produced by Energy, Mines and Resources Canada; and a variety of geological and geochemical-related maps and reports produced by this Department.

TABLE 4. Drill core acquisitions to the Stellarton Core Library for the 1987-88 fiscal year.

NTS	Company or Organization	Year Drilled	Commodity or Project	Location	County	No of Holes	Hole Names	Core Size	Total Feet	Total Metres
11-D-5	NSDME, Mineral Development Division	1987	Building stone	Terence Bay	Halifax	12	TB87-1 to TB87-12	BQ	1020	310.9
11-E-1	Inco Ltd. (SCOMINEX)	1985	Gold	Cochrane Hill	Guysborough	11	72603-72604, 72608-72615	NQ	6020	1834.9
11-E-1	Inco Ltd. (SCOMINEX)	1987	Gold	Cochrane Hill	Guysborough	16	72641-72653, 72655-72657	NQ,BQ	7193	2192.4
11-E-1	Inco Ltd. (SCOMINEX)	1986-87	Gold	Cochrane Hill	Guysborough	28	77301-77314, 77316-77329	BQ	2551	777.5
11-E-1	Inco Ltd. (SCOMINEX)	1985	Gold	Goldenville	Guysborough	1	72626	NQ	815	248.4
11-E-2	Sunrise Metals Corporation	1988	Gold	Beaver Dam	Halifax	5	SM-88-1 to SM-88-5	NQ	1963	598.3
11-E-2	SDME, Mineral Resources Division	1987	Geology	Ten Mile Lake	Halifax	1	TML-87-1	HQ,NQ,	3347	1020.2
11-E-2	Four Seasons Resources Inc.	1987	Gold	Beaver Dam	Halifax	6	BD-4 to BD-9	NQ	2499	761.7
11-E-3	Lafarge Canada Inc.	1988	Limestone	Brookfield	Colchester	9	HWY-102-01 to HWY-102-09	BQ	778	237.1
11-E-3	NSDME, Mineral Resources Division	1987	Geology	Alton	Colchester	1	ALT-87-1 (in progress)	HQ,NQ	1417	431.9
11-E-3	Canada Cement Lafarge Ltd.	1986	Gypsum	Brookfield	Colchester	7	BFG-86-02 to BFG-86-06 BFG-86-08, BFG-86-09	BQ	878	267.6
11-E-5	Canada Cement Lafarge Ltd.	1987	Limestone	North Maitland	Hants	4	NM-87-01 to NM-87-03, NM-87-09	BQ	167	50.9
11-E-6	Canada Cement Lafarge Ltd.	1987	Limestone	Manganese Mines	Colchester	14	MM-87-01 to MM-87-14	BQ	535	163.1
11-E-6	Lafarge Canada Inc.	1988	Limestone	Black Rock	Colchester	5	BR-88-01, BR-88-02, BR-88-04 to BR-88-06	BQ	277	84.4
11-E-6	Lafarge Canada Inc.	1988	Limestone	Beaver Brook	Colchester	6	BB-88-01 to BB-88-06	BQ	444	135.3
11-E-6	Lafarge Canada Inc.	1987,1988	Limestone	South Maitland	Hants	10	SM-87-02 to SM-88-11	BQ	106	32.3
11-E-8	Great Horn Mining Syndicate Inc.	1971	Copper	Lochaber	Antigonish	3	L-10, L-13, L-14	BQ	1623	494.7
11-E-10	NSDME, Energy Resources Division	1987	Coal, oil shale	Coalburn	Pictou	1	P-59	HQ	749	228.3
11-E-10	NSDME, Energy Resources Division	1987	Coal, oil shale	Coalburn	Pictou	1	P-59A	HQ,NQ,	3399	1036
11-F-14	NSDME, Mineral Development Division	1988	Limestone	Marble Mountain	Inverness	5	MM-88-1 to MM-88-5	NQ	1314	400.5
11-F-16	Inco Ltd (SCOMINEX)	1986	Gold	Ben Eoin	Cape Breton	5	72636 to 72640	BQ	1537	468.6
11-F-16	NSDME, Mining Engineering Division	1987	Mineral Deposit Studies	Salmon River	Cape Breton	7	Yava 415 to Yava 421	NQ	699	213
11-K-3	Scotsville Mineral Resources	1984	Barite	Scotsville	Inverness	18	DDH 84-1 to DDH 84-18	NQ	1398	426.2
11-K-7	NSDME, Mineral Development Division	1987	Building Stone	First Fork Brook	Inverness	2	FFB-87-1 to FFB-87-2	BQ	283	86.3

TABLE 4. (continued)

NTS	Company or Organization	Year Drilled	Commodity or Project	Location	County	No of Holes	Hole Names	Core Size	Total Feet	Total Metres
20-O-16	NSDME, Mineral Development Division	1987	Silica, garnets	Chegoggin-Lake George	Yarmouth	9	CHLG-87-1 to CHLG-87-9	NQ,BQ	3270	996.7
21-A-6	NSDME, Mineral Resources Division	1987	Geology	Caledonia	Queens	1	HIB-87-1	HQ,NQ	2056	626.7
21-H-1	Dynamic Consolidated Resources Ltd.	1988	Base Metals, Silver	Walton	Hants	7	S-88-1 to S-88-6	HQ,NQ	5681	1731.6
21-H-9	NSDME Mining Engineering Division and Nova Scotia Power Corporation	1987	Geothermal studies	Springhill	Cumberland	2	SH-87-1-T and SH-87-2-T	HQ,NQ	463	141
21-H-9	NSDME, Energy Resources Division	1988	Coal	South Athol	Cumberland	1	SA-88-1 (in progress)	HQ	500	152.4
TOTAL						198			52,982	16 148.9

Core acquired from departmental drilling program:	18,517 ft. (5 643.9m)	from	43 holes (11 projects)
Core acquired from mining companies drilling programs:	34,465 ft. (10 505m)	from	155 holes (15 projects)
TOTAL	52,982 ft. (16 148.9m)		198 holes

Core sizes (diameter):
BQ = 1.432 inches (36.5mm)
NQ = 1.875 inches (47.6mm)
HQ = 2.500 inches (63.5mm)

ENERGY BRANCH

C. Ryan, P.Eng.
Assistant Deputy Minister

Nova Scotia is heavily dependent on petroleum for its everyday needs. Approximately 62 per cent of its primary energy comes from petroleum, most of which is imported from foreign sources.

The provincial government has set a goal to reduce this dependence by developing Nova Scotia's indigenous energy resources; gaining access to Canada's energy resource base; and improving the efficiency of energy use.

The mandate of the Energy Branch is to initiate and implement policies and programs to achieve the government's energy goals. The Branch consists of three divisions — Energy Resources, Energy Management, and Economics and Statistics. The Energy Resources Division focuses on the exploration for and the development of Nova Scotia's indigenous resources, particularly oil and gas, coal and peat. The Energy Management Division provides technical assistance to increase the efficient use of energy in the province and to educate people about energy conservation. The Economics and Statistics Division provides co-ordination for provincial energy planning, economic analysis and policy advice.

ENERGY RESOURCES DIVISION

A. G. Batcup, P Eng, Director

INTRODUCTION

The Energy Resources Division is accountable for the effective evaluation, promotion and regulation of Nova Scotia's energy resources. The Division's activities are primarily concerned with the two main hydrocarbon resource sectors: petroleum (oil and gas) and coal.

During the 1987-88 fiscal year, world oil prices fluctuated between U.S. $15 and $20 per barrel. Although this was an improvement on the average for the previous year, the range of fluctuation caused the energy industry to be very cautious with regard to future investment plans. World oil prices affect the Division's activities directly in the case of petroleum exploration and development, and indirectly in the case of a competing fuel such as coal.

Early in the fiscal year, the Petroleum Resources Section was heavily involved in the preparation of legislation implementing the Canada-Nova Scotia Offshore Petroleum Resources Accord. This was passed by the provincial legislature in May, 1987. Subsequently, the Section contributed to the drafting of offshore regulations by the Canada Oil and Gas Lands Administration (COGLA) on drilling activities, and on safety and health matters. The Section also drafted onshore drilling regulations and promulgated onshore coal-gas regulations.

Much analysis and discussion took place concerning the possible development of either the Venture Gas Project or the Cohasset/Panuke Oil Project. However, the consensus was that some sustained improvement in the world oil price was needed before either project could progress to the development stage.

Onshore petroleum exploration agreements netted the province $189,607 in rentals and, in March, 1988, Irving Oil and Chevron Canada announced plans to drill the first onshore well since 1984. The well is to be called Irving Mull River No. 1, and will be located near Mabou in Cape Breton.

In the second half of the fiscal year, there was great public debate over Texaco's plans to drill two exploration wells on the Georges Bank fishing grounds. Opposition to drilling was led by the NORIG organization; towards the end of the fiscal year, it looked as though the federal and provincial governments would move to prevent drilling pending a thorough inquiry into the environmental and social impacts of such activity.

Environmental matters, this time in the form of the Canada-Nova Scotia Acid Rain Agreement signed in February 1988, also influenced the thrust of the Coal Section's activities. The Agreement emphasizes importance of the province's reserves of low sulphur coal (such as in the Pictou basin) and looks at how higher sulphur coals can be converted into lower sulphur products or burnt more cleanly.

Following the bid withdrawal of Dome Plaur due to corporate reorganization, Suncor invited bids for their Pictou County coal property in the last quarter of 1987. Westray Mining emerged as successful bidder and entered into negotiations, as well as Suncor regarding sale of the property. These negotiations, those with principal customer Nova Scotia Power Corporation, were ongoing at the end of the 1987-88 fiscal year. The federal government may provide financial assistance, enabling mine development to begin. Coal section geologists provided advice to all bidders during the bidding process. These same geologists also promote and discuss other low-sulphur coal prospects in Nova Scotia with potential developers.

During the fiscal year, co-operative geological work with the Cape Breton Development Corporation (CBDC) was expanded to include the Lingan and Phalen mines. The coal-water fuel demonstration project using CBDC's Carbofuel product got underway at Minas Basin Pulp and Power's plant at Hantsport. This project is partly funded by the Canada-Nova Scotia Oil Substitution Fund, and marks the first time in Canada that coal-water fuel has been used to raise process steam.

In the 1987-88 fiscal year, the need for funds to carry out further coal research and development in order to find new ways of utilizing our high sulphur coals was identified by the Coal Section as a high priority. The Section is currently pursuing various sources of funds for this research.

The locations of Energy Resources Division projects are shown on Figure 6.

Petroleum Resources Section

C. Andrew Parker, PEng, Manager

INTRODUCTION

The Petroleum Resources Section is responsible for monitoring, evaluating and regulating petroleum exploration and development activities onshore. Offshore exploration and development takes place in conjunction with the Nova Scotia office of COGLA.

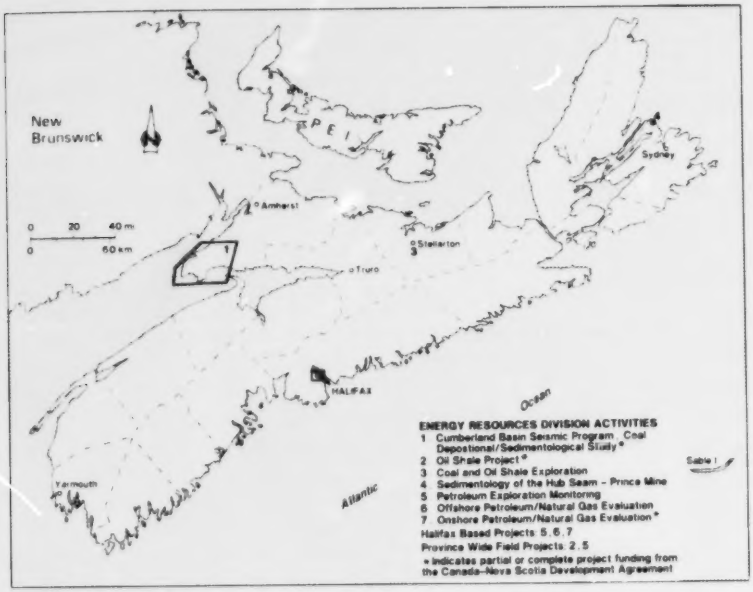


FIGURE 6. Project locations of Energy Resources Division.

The 1987-88 fiscal year was a productive period, although the level of exploration activity on the Scotian Shelf continued to be low. The Section's main activities included the administration of onshore projects in addition to monitoring and evaluating offshore exploration and development programs. During this period:

- efforts continued to determine if small scale oilfield development is feasible offshore
- exploration continued, with three wells being completed in the Sable Island area
- the westerly extent of the Panuke reservoir was demonstrated with the successful drilling of the Panuke F-99 well
- rentals of $189,607 were received in respect of the active onshore exploration agreements
- an onshore geological field program was conducted by Chevron/Irving; the data collected was analyzed by Chevron/Irving as well as the Section

Offshore Exploration and Development

One of the highlights during the fiscal year proved to be the discovery of additional oil reserves in the Panuke field. Petro-Canada drilled the Panuke F-

99 delineation well and successfully completed an extended production test. During a unique six-day testing procedure utilizing a tanker, 3 600 m^3 were collected and shipped to Montreal for refining and further testing. This is the first shipment of crude oil from Canada's east coast offshore.

Petro-Canada also drilled the Como P-21 well. However, it did not encounter significant oil or gas pay and was abandoned without testing.

Canterra drilled the Whycocomagh N-90 well which also was abandoned without testing.

At the completion of the 1987-88 fiscal year, a total of 509 921 ha was held under active exploration agreements (EAs). In addition to the active EAs, there are 96 249 ha held by industry under significant discoveries; 3.5 million ha of lands are not currently open to exploration on Georges Bank as well as lands adjacent to St. Pierre and Miquelon. A summary of these lands is presented in Table 5 and Figure 7.

TABLE 5. Offshore land summary at end of fiscal year 1987-88

Representative	EA Number	Description	Area (Hectares)
Husky	269	West Chebucto	88 033
Canterra	270	Whycocomagh	72 312
Shell	275	Penobscot	6 660
Shell	277	Alma	5 589
Mobil	283	Sable Island	183 047
Shell	298	Uniacke	14 044
Shell	299	Glenelg	92 166
Petro-Canada	300	Panuke	9 305
Subtotal			471 156
Significant Discovery Lands			96 249
Rights not currently open to exploration — Georges Bank and St. Pierre and Miquelon			3,500,000
TOTAL			4 067 405

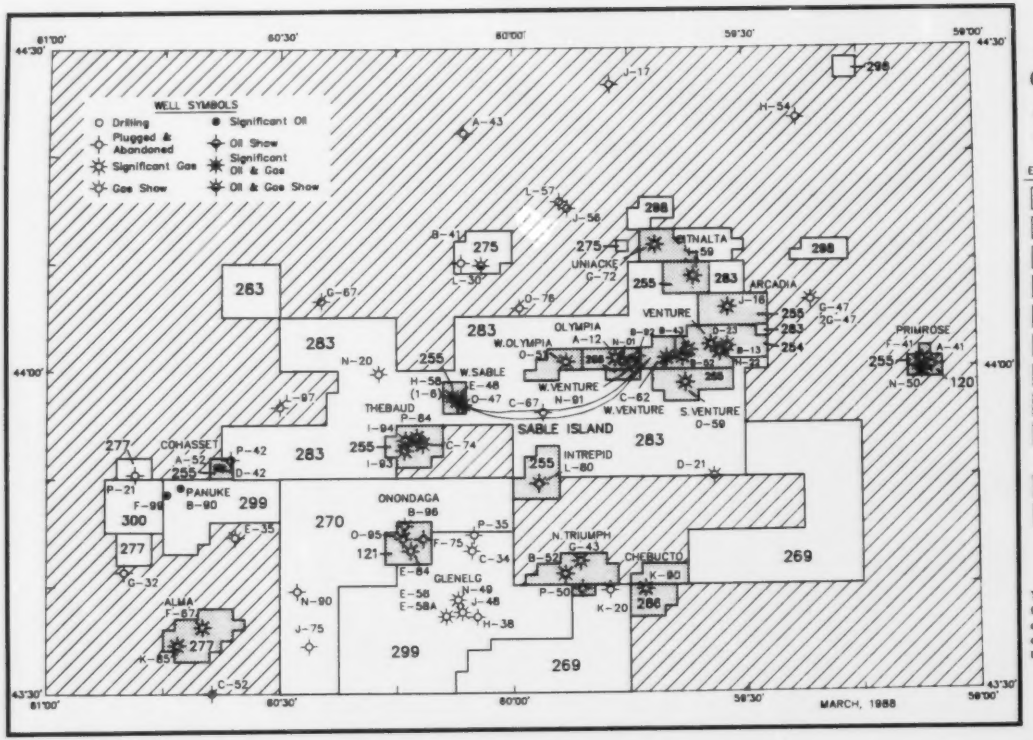


FIGURE 7. Offshore exploration agreement locations.

The following three wells were completed during the fiscal year 1987-88:

Well Name	Operator	Type of Well	Results
Whycocomagh N-90	Canterra	Exploration	Dry and Abandoned
Como P-21	Petro-Canada	Exploration	Dry and Abandoned
Panuke F-99	Petro-Canada	Delineation	Oil Well

The Petroleum Resources Section worked with COGLA in the day-to-day administration of ongoing drilling activites for these wells.

The successful delineation of the Panuke oilfield in the fiscal year led to renewed efforts to determine the feasibility of small-scale oil development. This may lead to increased exploration activity, relating to oil development offshore Nova Scotia. The possibility exists that the Panuke structure could be produced in conjunction with Cohasset, because of the proximity and similarity of both structures.

Onshore Exploration Activity

In March, 1988 the Section began processing a Drilling Program Approval application, submitted by Chevron Canada Resources Ltd., to drill the Irving Chevron Mull River #1 which was scheduled to be spudded in May, 1988.

The Section assisted Chevron in obtaining various permits and approvals required under the Nova Scotia Onshore Drilling Regulations.

In July 1987, the Sigma Resources Ltd. exploration agreement was terminated. Four exploration agreements were concluded for onshore Nova Scotia in the fiscal year (Table 6). These are shown on Figure 8.

Currently, there are two proposed coal gas projects; Novacorp's drainage project in Pictou County and CBCD's demethanization of the Lingan coal mine. The Novacorp Pictou County Project consists of two wells, which are producing a total of 20 000 cubic feet per day (CFD). The production rate is too low for full scale commercial development. However, there are efforts to tie the existing two wells into a small pipeline to supply coal gas to a local business, replacing

TABLE 6. Summary of onshore oil and gas rights holders

Licensee	Negotiated (acres)	Area (hectares)	No. of EAs Negotiated	Rentals Paid
Chevron Canada Resources Ltd.				
Cape Breton	1 469 743	594 805	2	$ 71,376.60
Cumberland	2 066 382	836 265		$100,351.80
Miles	315 468	127 719	1	15,641.04
Consultants A.G.R.E.N. Canada Inc.	46 780	18 648	1	2,237.76
Total	3 898 373	1 577 437	4	$189,607.20

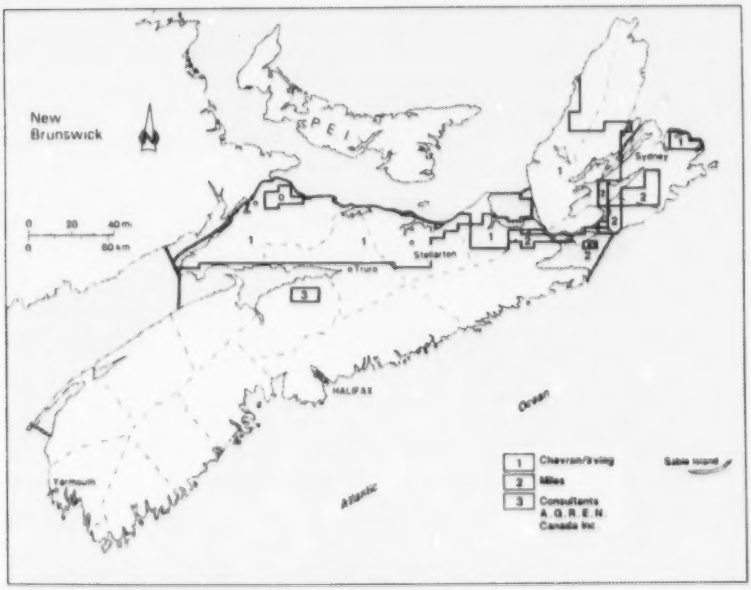


FIGURE 8. Onshore exploration agreement locations.

heating oil. The CBDC is producing 2.0 million CFD of coal gas from the Lingan mine, which is currently being vented. The corporation is now developing plans to utilize this coal gas to generate on-site electricity for mine use.

Other Related Activities

The Section prepared and completed regulations to provide for the management of Nova Scotia's coal gas resource. These regulations were promulgated December 1, 1987.

The Section helped draft Nova Scotia's response to COGLA concerning proposed amendments to the Canada Offshore Oil and Gas Drilling Regulations, Operations Regulations, Oil and Gas Occupational Health and Safety Regulations, Production and Conservation Regulations, Geophysical Regulations, Standby Vessel Standards, Drilling Equipment Standards, Drilling and Marine Crew Training Standards, as well as to the recommendations of the Royal Commission on the Ocean Ranger Marine disaster.

The Section prepared a submission to the federal government, based on an enlarged Venture Project, to demonstrate that early development of the gas reserves offshore Nova Scotia was viable.

An onshore source rock study, initiated by the Section last year under the Federal-Provincial Mineral Development Agreement (MDA), continued during the 1987-88 fiscal year. Data obtained is being processed. A number of new insights, interpretations and discoveries will be highlighted in the final report scheduled to be published during the next fiscal year.

Due to increased interest in seismic information within the last few years, a report — *Reflection Seismic Coverage of Onshore and Nearshore Nova Scotia 1942-1987* — was compiled by the Section this fiscal year. This report presents a summary of past seismic projects within the province and is designed to encourage research by interested parties. It will be published in the next fiscal year.

The Section produced the seventh annual publication *Oil and Gas Exploration in Nova Scotia.* It has compiled a variety of maps and display materials for various oil and gas trade shows, as well as for the Department's open house.

Staff continued to be active on several committees:

- Environmental Co-ordinating Committee
- Sable Island Environmental Advisory Committee
- Canadian Standards Association (CSA) Steering Committee for Offshore Structures
- Joint Land Management Committee
- Geophysical Regulations Committee

- Oil and Gas Occupational Safety and Health Regulations Committee
- Frontier Geoscience Committee
- Production and Conservation Regulations Committee
- Canada Oil and Gas Drilling Regulations Committee

Coal Section

C. E. Bain, P Eng, Manager

INTRODUCTION

The Coal Section of the Energy Resources Division comprises two groups: Coal Exploration and Coal Development.

The mission of the Coal Exploration group is to assess the coalfields of Nova Scotia to determine the availability, quantity and quality of underground and surface deposits of coal. This group collects and analyzes field program data, and provides technical assistance in coal exploration and development matters to industry and to other government departments.

The Coal Development Group encourages and co-ordinates the development and efficient use of coal and coal products. Specific activities within this mandate include:

- monitoring demand for coal within the province and encouraging its use as a substitute for imported fuels
- monitoring Canadian and international developments in coal conversion and utilization technologies and determining their relevance to Nova Scotia
- monitoring and assessing coal supply with a view to identifying new coal mining opportunities
- assessing proposals from private sector coal exploration programs
- preparing coal and peat development and utilization policies

In summary, the role of the Coal Section is to explore, evaluate and promote the development and use of the coal resources within the province.

DEVELOPMENT AND UTILIZATION

The future of coal, one of the province's most important resources, will depend on the development of new technologies for its use as well as the implementation of optimum mining, processing, handling and transportation systems. The Coal Section monitors the research and development of coal utilization to evaluate its application to the Nova Scotian coal industry. The Section is also involved in other research and development projects within the province including coal

beneficiation, coal gasification, fluidized bed combustion, coal liquid mixtures, coal liquefaction and coal/oil co-processing.

The Section constantly analyzes barriers to expanded coal utilization and directs research toward solving them. Coal transportation, blending facilities, optimum use of existing infrastructure, cost-effective means of reducing combustion emissions and market competition with alternate fuels are just a few of the issues addressed by the Department.

Committee on Atlantic Coal (CAC)

The Committee on Atlantic Coal (CAC), established in 1982, unites the scientific expertise from diverse institutions in the Atlantic Provinces to focus on specific problems related to the mining and utilization of coal. The CAC also facilitates communications between industry and the research and development community.

The Coal Section solicits funding for research and development (R & D) and co-ordinates the R & D program for the CAC. The CBDC committed $250,000 to the CAC's R & D program in fiscal year 1987/88, with matching funds from Energy, Mines and Resources Canada. Similar commitments have been made for 1988/89. Projects funded in 1987 relate to resource assessment, underground mining, health and safety, and coal utilization.

Coal Research, Development and Demonstration

The Coal Section continued its involvement through 1987 with projects to:

- develop a direct liquefaction process for Nova Scotia coals that can sustain high liquid yields of good quality products
- assess and develop the beneficiation potential of eastern Canadian coals
- determine the atomization characteristics of coal water fuels and demonstrate the feasibility of these fuels for industrial users
- assess the feasibility of using a commercial-sized, circulating fluidized bed unit with Nova Scotia coal
- evaluate coal gasification technologies and their application with Nova Scotia coals for power generation and/or chemical feedstock production

Coal Liquefaction The Department continued to fund the coal liquefaction research program at the Nova Scotia Research Foundation Corporation (NSRFC) laboratories in conjunction with Energy, Mines and Resources Canada. Extensive test work on two-stage direct liquefaction continued in 1987 at NSRFC, with the objective of developing a process suitable for Nova Scotia

coals that can sustain high liquid yields (approximately 5 barrels per tonne of coal). Thermal/catalytic and catalytic/catalytic processes are being tested with several catalysts and three coals — Prince, Lingan, and Donkin-Morien. This research program, which will continue until at least March 1989, will identify the most reactive coal and the relative merits of various two-stage process configurations. This investigation is being complemented by two longer tests (20-day continuous runs) funded by the Oil Substitution Agreement.

Coal Beneficiation The project to "Assess the Beneficiation Potential of Eastern Canadian Coals" was completed in 1987. This program was carried out under the auspices of the CAC, with over $2 million in funding from the Energy, Mines and Resources Canada Coal Utilization Program. The final report includes the following information:

- results from pilot plant coal cleaning tests with Prince and Donkin coals
- combustion characteristics of run of mine and cleaned coals
- beneficiation plant design and economics
- benefits of using cleaned coal
- fines recovery and rejects utilization

Coal Liquid Mixtures During the fiscal year, two coal liquid fuel projects were funded through the Canada-Nova Scotia Oil Substitution and Conservation Agreement. The projects are:

- Rheology and Spray Testing. This program, conducted at NSRFC, established test facilities to determine the specifications of various coal liquid fuels and how these specifications can be modified to make the fuels more compatible with user facilities and requirements. Previously, there were no such testing facilities for coal liquid fuels in Canada. In addition, a variety of fuel additives are being tested with the objective of reducing coal water fuel costs.
- Minas Basin Coal Water Fuel Conversion. A demonstration project has been initiated to show the viability of coal water fuels as an alternative to residual fuel oil. A boiler was converted to burn coal water fuels at the Minas Basin Pulp and Power Co. Ltd. in Hantsport. This boiler, in combination with the existing waste wood fired-boilers, has the capability of providing all the process steam requirements from indigenous resources within the province. During its two year trial period, the coal water fuel-fired boiler will be available for inspection by industries interested in diversifying their source of energy.

Fluidized Bed Combustion A study to determine whether Nova Scotian coals can be economically utilized in a 150-megawatt, commercial scale, circulating

fluidized bed unit was funded under the Oil Substitution Agreement and is being conducted by the Nova Scotia Power Corporation (NSPC).

Coal Gasification Technology Because of its ability to meet stringent environmental restrictions and its potential for high efficiency, coal gasification technology for electricity generation or the co-production of chemical feedstocks is commanding widespread interest. The Atlantic Coal Institute is carrying out a study for Nova Scotia that will:

- review and assess gasification processes
- characterize Nova Scotia coals
- evaluate the economics and environmental performance of coal gasification
- select the most appropriate coal for gasification along with the most suitable process
- test a Nova Scotia coal in a bench scale asifier unit

Oil Substitution and Conservation

The Canada-Nova Scotia Oil Substitution and Conservation Agreement was initiated in 1977 to reduce Nova Scotia's dependence on imported oil through conservation and displacement by coal or renewable resources. The program was scheduled to be completed by March, 1987, but has been extended until March, 1989 to allow completion of approved projects. However, no new projects can be considered. The Coal Section administers the day-to-day details of the program.

Coal projects related to fluidized bed combustion, coal gasification, coal liquefaction and coal water fuels were funded under this program in 1987/88. Further information on these projects can be found in other sections of this report.

A consultant is currently preparing a report on future potential oil substitution projects in Nova Scotia.

COAL GEOLOGY

In the fiscal year 1987/88, the Coal Development Section continued to evaluate the provincial coal resources and to maintain liaison with private companies engaged in coal mining or exploration. The Section also continued its involvement with several projects funded under the CNSMDA. They include the federally-financed Coal Database Project and the seismic surveys conducted in Cumberland County. The provincially- funded Oil Shale Assessment completed field work during the year.

Coal Geology Database Work continued for the third year on the construction of a comprehensive computer database of geological and coal analytical data for the Nova Scotia coalfields. This project has been implemented by the Geological Survey of Canada (GSC) in co-operation with the Department. The compilation, interpretation, coding, data entry and verification of location, as well as lithological and coal quality information from drill holes, outcrops and mine workings are duties performed by contract personnel utilizing the GSC's computer in Calgary via dedicated line and on-site terminals in Halifax.

In 1987/88, this work continued on the coalfields of the Cumberland Basin. As well, data entry commenced for the Pictou coalfield. To date, 1215 drill holes, with an aggregate footage of 135 000 m, have been entered. Analytical data includes 2180 samples from drill holes and approximately 3000 channel samples from underground mines.

Preliminary work has been done this year at the Institute of Sedimentary and Petroleum Geology, utilizing the Sydney coalfield database to generate posting maps of hole locations and cross-sections of major seams. Funding to extend the original project was successfully pursued enabling operators to enter extensive information into the database.

Coalfield Geology Geological investigations continued in the Sydney, Pictou, Springhill and Joggins-Chignecto coalfields.

In the Sydney coalfield, a co-operative study was undertaken with the CBDC's Geology Department. The purpose was to characterize the occurrence and behavior of a major channel belt in the Hub Seam roof strata at the Prince Mine resource block. Such channel sandstones constitute a critical factor in mine planning, since they can affect coal mineability and quality as well as mine safety.

A detailed sedimentology study of the Hub Seam roof strata from five offshore drill holes was integrated with data from CBDC's underground mapping in the Prince Mine. A stratigraphic model was developed, based on the nature and distribution of the channel-related lithofacies associations. This has produced conclusions about the nature of the channel system and its possible effects on the character of roof strata as mining advances.

Systematic palynological sampling was also done in the Sydney coalfield in co-operation with the CBDC's Geology Department, the Mineral Resources Division, and Dr. M. Gibling of Dalhousie University. This program was initiated to refine age determinations for the coal-bearing Morien Group and will provide data to aid in the reconstruction of coalfield paleogeography. This will ultimately assist in the preparation of paleoenvironmental exploration-development models for these coal deposits.

At New Campbellton, Victoria County, near the western margin of the Sydney coalfield, a drill hole to investigate the stratigraphy, structure and coal resource potential of this district was completed. The geology and resource potential of this area was poorly documented to date, even though it has a sporadic coal mining history. The drill hole penetrated the lower Sydney Mines Formation (below the Bouthillier Seam horizon) and the South Bar Formation of the Morien Group.

The historically productive local "Fourfoot" Seam was identified in the drill hole as the Backpit Seam. It is 1.03 m thick, with ash and sulphur contents of 12.19% and 6.91% on an "as received" basis respectively. The accessible part of this resource has been extracted, leaving an in-place underground resource of about 1.8 million t which cannot be considered of current economic interest. The Phalen Seam horizon, which was previously assumed to represent the "Sixfoot Seam" and was mined to a small extent along the Mountain Fault, is probably a faulted repeat of the Fourfoot Seam within this severely deformed fault zone.

In the Pictou coalfield, assessment of the structure and stratigraphy of the coalfield was aided by the exploration activity of Placer Incorporated. Cross-sections of the coalfield, based on past and present exploration, have been completed.

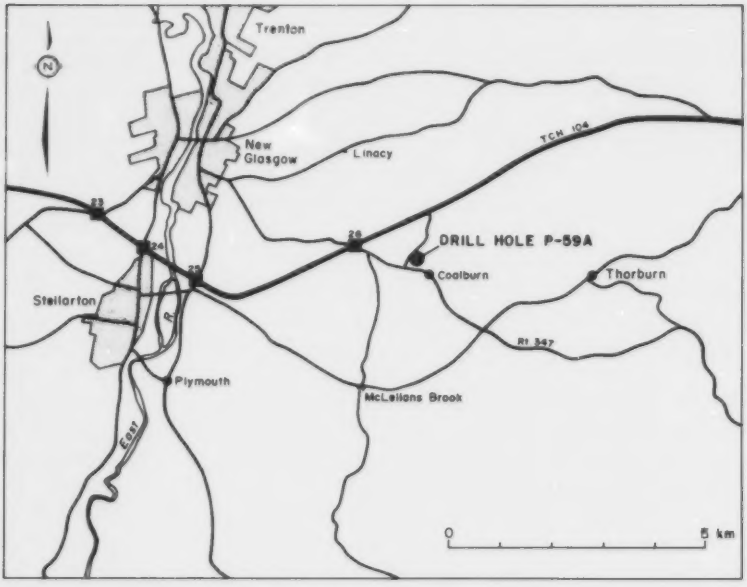


FIGURE 9. Pictou coalfield drill hole location.

A single hole (P-59A: Fig. 9) was drilled by the Department in the Coalburn area to investigate the eastern extension of coal seams that had been mined west of East River (which had constituted the major mining district of the Pictou coalfield), and to determine whether these seams might underlie the Thorburn district. Hole P-59A was drilled to a depth of 1043 m and at 1035 m a coal seam was discovered, which was 6.2 m thick with a 2.2 m mudstone parting. Unfortunately, the hole had to be terminated due to adverse drilling conditions. However, the drill hole proved the existence of coal at a depth approximately 3 km further east of the nearest mine workings on the Foord Seam, indicating the possibility that the coal seams of the Stellarton district may underlie those of the Thorburn district.

Seismic Surveys

In the Cumberland Basin, a reflector seismic program continued during the year.

From 1985-87, 80 line-km of seismic data were shot as a federally-funded program under the CNSMDA. The results of initial processing reveal the detailed stratigraphic nature of the Cumberland Group and, to a lesser degree, the Riversdale Group throughout most of the Athol Syncline. The coal-bearing lithofacies assemblages appear to provide well-defined reflectors in the survey sections. Where possible, the seismic lines were run to tie in the known surface geology of the Springhill and Joggins-Chignecto coalfields (Fig. 10).

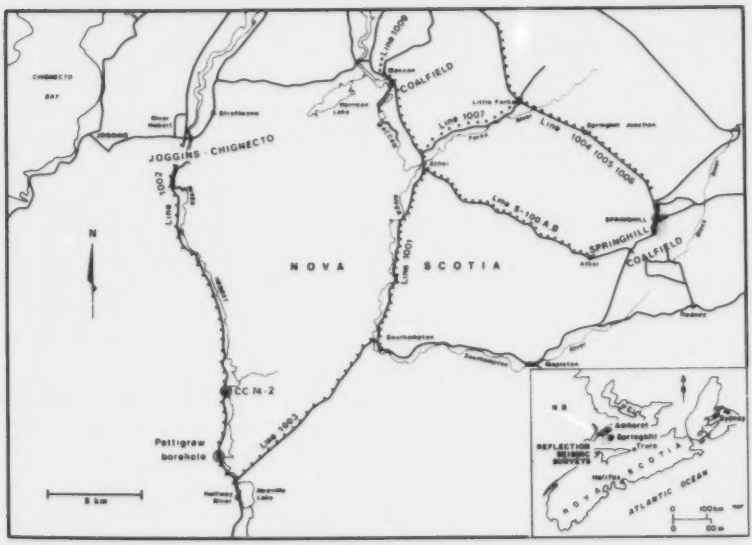


FIGURE 10. Seismic line locations in the Cumberland Basin.

The objective of the Cumberland Basin seismic program was to define the stratigraphic and gross structural relationship between known coalfields (Springhill, Joggins-Chignecto) and coal occurrences (e.g. Newville Lake), so as to shed light on possible coal exploration targets within the Athol Syncline. The coal-bearing strata of the Joggins-Chignecto and Springhill coalfields occur within a package of well-defined reflecting events that can be traced virtually throughout the Athol Syncline. This does not necessarily mean that these events represent individual coal seams of basin-wide extent. Rather, the coal-bearing strata typically comprise thick multi-storied sandstones, and mudrocks that provide the required velocity contrasts for such reflectors. The interpretation of the seismic data will provide valuable insight into the precise stratigraphic relationship between the two major coalfields of Joggins-Chignecto and Springhill.

A portion of the survey, which is of particular interest for coal exploration, is the central section of line 1001 between Athol and Southampton, approximately 18 km west of the Springhill coalfield. Within the major reflecting package, individual reflectors record progressive onlap of younger strata to the south. This aspect of the stratigraphy closely resembles the progressive onlap of the Springhill coalfield coal seams over distal alluvial fan-related deposits to the south. The resemblance in stratigraphic architecture between the two areas implies similar basin infilling and paleogeography which can be considered favourable for coal potential.

Should coal seam development here mirror that of the Springhill coalfield, then the most extensively-developed coals would be expected to occur at approximately 1400 m depth, near the axis of the Athol Syncline. Younger, less extensively-developed coals situated further south toward Southampton would be expected to occur at approximately 1100 m depth. These depths are calculated from inferred velocities; accurate velocity data awaits future deep drilling and subsequent sonic logging.

To the west along the Boars Back Road line (1002), between Newville Lake and River Hebert (Fig. 3), coal exploration prospects are suggested by the occurrence of coal seams in the Pettigrew hole; drilled 1.5 km north of Newville Lake in 1903, and the Cera-Caledonia hole CC75-3, drilled a further 3 km north in 1974 (Fig. 10). Preliminary interpretations suggest that these coal-bearing strata are structurally dislocated from the deeper, well-defined reflector package to the north by a major basin-related fault system. This package is in part stratigraphically equivalent to the Joggins coal section. Exploration efforts in this vicinity await tectonic interpretation of these major structural features.

Oil Shale Assessment

Oil shale occurrences have been reported in areas of Cape Breton, the northern mainland and Annapolis Valley areas of Nova Scotia since the 1800s (Fig. 11). A three-year, province-wide investigation of the geology and composition of these resources was funded by the Department under the CNSMDA to assess their quality and quantity. Project work started in the Stellarton Basin (Pictou coalfield: the province's largest and best known occurrence of oil shale) in fiscal year 1984/85 and continued into 1987/88. Work expanded to include occurrences elsewhere in the province during the fiscal years 1986/87 and 1987/88.

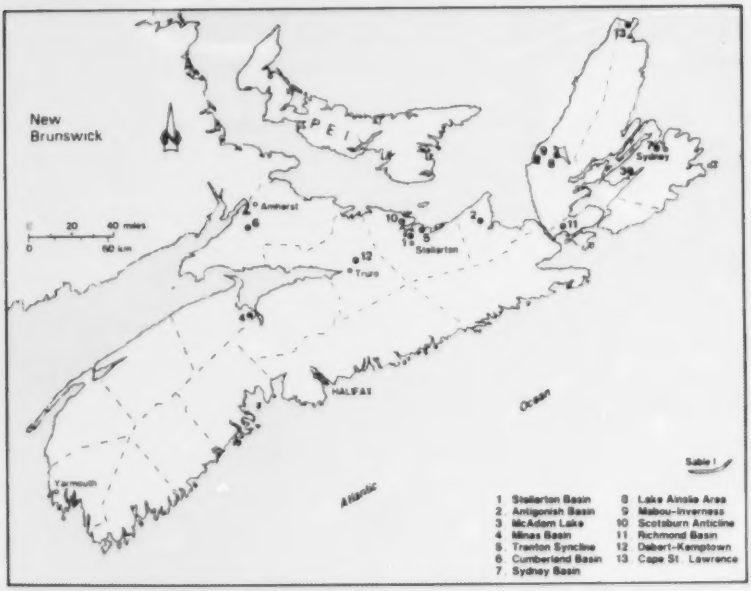


FIGURE 11. Locations of oil shale occurrences.

Information on the location, lithology, chemistry, yield and stratigraphy of these resources are available through Information Series Nos. 9, 12; Reports 87-1, 87-5; and Open File Reports 86-051, 86-052. Field work done in conjunction with the Stellarton Basin project has also been used to produce a 1:5000 scale geological map of the eastern half of the basin; available as Open File Map 86-047. Information on the reported oil shale occurrences is being compiled into a report for release in the next fiscal year (1988/89). It will incorporate previously unpublished data from earlier workers, data from the reports cited above, plus original work.

Data collected through project work indicates that many of the occurrences are merely organic-rich shales, and as such do not hold interest as a future source of direct energy. The principal oil shale resources of the province are contained within the Stellarton and Antigonish Basins, while areas of possible interest include the Trenton Syncline and the Cumberland and Sydney Basins. The report in progress will include an estimate of the quantity of resources available at the principal oil shale locations.

The resource is considered to have yields too low for immediate direct utilization but may be of importance to the province's future energy reserves. However, a scheme for indirect uses of the oil shales may enhance the economics of their development. In keeping with the mandate to identify new energy resources and solutions to utilization barriers, an investigation into the utilization possibilities of the province's oil shales has been proposed for funding as part of a new, wide-ranging Energy Resource Development Sub-Agreement (ERDA).

The occurrence of oil shales and organic-rich shales in the province may hold interest for companies engaged in hydrocarbon exploration. The presence of hydrocarbon shows and accumulations in the Maritimes (Stellarton Basin, Hants County, Lake Ainslie, Moncton Basin), in age equivalent strata to some of these oil shale/organic-rich shales, suggests that they may have acted as a petroleum source rock; a potential that is worthy of investigation.

In several cases, the oil shales/organic-rich shales are associated with deposits of coal. The shales have been found to be recognizable marker beds within these basins and therefore useful for correlation. In the Stellarton Basin, this use of the oil shales has proven to be a valuable tool in coal exploration.

ENERGY MANAGEMENT DIVISION

Director, Greg Haverstock, PEng

INTRODUCTION

The Energy Management Division has three primary responsibilities. It

- evaluates, analyzes, and contributes to policies and technologies affecting energy supply and demand
- implements energy efficiency and conservation programs, fuel substitution programs, and renewable and indigenous energy resource programs, and
- provides programs that increase public awareness of energy conservation, energy supply options, provincial energy policies, plans and programs.

ORGANIZATION

The division is composed of two sections: Energy Programs, and Energy Engineering. The Energy Programs Section includes the Provincial Energy Analysis Program, which delivers energy analysis and follow-up programs to the public sector, Residential Energy Programs, which provide energy conservation services and project management to the residential and transportation sectors; and the Energy Education Program, which provides educational information on energy use and fuel substitution to students and educators. The Energy Engineering Section provides the planning, execution and management of technical studies and energy conservation and renewable energy projects. The Economics and Statistics Section, part of the Energy Management Division at the beginning of the fiscal year, is now a separate division.

ACTIVITIES

A significant number of projects were funded under the Canada-Nova Scotia Memorandum of Understanding on Conservation and Alternative Energy (MOU), a two-year agreement covering the 1986/87 and 1987/88 fiscal years. The governments have agreed to extend the Agreement until March 1989, to permit work initiated during the previous two years to be completed and to enable several new projects to begin.

In the renewable energy sector, three major studies of wood energy were completed under MOU during fiscal year 1987/88. Two reports examined the barriers to increased use of wood fuel by institutions and by industry respectively, while a third study compared wood and coal-fired power generation costs.

In the industrial/commercial sector, MOU funds were expended on several projects. Information transfer projects included a seminar on heat recovery held at the Hotel Nova Scotian in Halifax, production of two slide/tape shows on arena and pool retrofits, assistance to the Nova Scotia Arena Managers' Association's *Save Energy* publication, and printing of project summary sheets. A computer room heat recovery demonstration and monitoring project was implemented at fiscal year end at the Nova Scotia College of Geographical Sciences, Lawrencetown.

The major initiatives in the transportation sector were the Pro-Trucker and Pro-Fisher programs. Through Pro-Trucker, information on training, operation, maintenance and purchase of trucks for fuel efficiency was provided in a half-day seminar. Pro-Fisher offered seminars to Nova Scotia inshore fishermen on fuel-saving opportunities regarding boat operation, maintenance, design and equipment selection.

In the residential sector, major initiatives included air leakage control work on 90 public housing units in Yarmouth and Halifax, draft proofing of 90 units owned by low income residents of Cape Breton County, and a study of moisture problems in housing that involved inspections and reports on 94 homes in the province.

Staff continued with efforts to increase the use of wood energy in Nova Scotia. The Select Committee of the Legislature on Forestry, Wood Chips and Biomass released its final report in May, 1987, and government announced a number of wood heating plants for new and existing buildings. The total wood use by these facilities will be almost 20 000 green t annually.

Division energy management programs continued to enjoy a favourable public reception in fiscal year 1987/88. Staff of the Provincial Energy Analysis Program performed energy analyses on 271 government buildings.

Requests from homeowners for publications and information on energy management and renewable energy continued to number in the thousands annually, and the Division continued to provide technical assistance to industry and business.

Division staff represents the Department on a variety of local, national and international committees dealing with energy issues of concern to the province. In May, 1987, the Department produced a 44-page manual on hot water heating, *Understanding Hydronic Heating Systems*, as a contribution to the Northeast International Committee on Energy (NICE).

ENERGY AWARDS

Each year the Division sponsors the Nova Scotia Energy Awards. Presentations are made by the Minister of Mines and Energy for outstanding contributions to energy management or fuel substitution. The following is a list of 1987 Nova Scotia Energy Award winners.

Category 1, Large Manufacturing

Canexel Hardboard Inc., East River
- Reduced energy costs by $328,000 by installing a wood dust burner to consume waste material.

Swedwood Canada Ltd., Dartmouth
- Saved 170 000 L of fuel oil annually by re-using waste heat from machinery and equipment, and by fully utilizing all wood waste from production processes.

Category 2, Business and Commerce

Hometite Services Ltd., Halifax
- This company has been active in energy conservation for the past nine years, with recent activities including the R-2000 Home program, residential air quality and various air sealing programs.

Joe's Warehouse Ltd., Sydney
- An energy conservation plan, instituted in 1986, reduced energy consumption by 35% and saved $26 000 per year with an investment payback period of eight months.

Category 3, Governments and Institutions

Fishermen's Memorial Hospital, Lunenburg
- The hospital, as part of a continuing energy conservation program, installed a solar domestic hot water system. Staff modifications allowed all hot water in the facility to be solar heated, substantially reducing the payback period and increasing the return on investment.

Valley View Villa, Stellarton
- Fuel oil used for heating was significantly reduced by an energy conservation plan of semi-annual heating system cleaning, seasonal control of boiler temperature, complete boiler shutdown when not required, and a preventive maintenance program to detect equipment failures.

Category 4, Organizations, Community Groups and Individuals

Mr. William Boucher and Mr. John Dewolfe, Halifax

- These St. Patrick's High School students developed a computer program called C.E.N.S.O.R.E.D. (Computer Enhanced Nova Scotia Orientated Renewable Energy Demonstration). This creative approach to a renewable energy application enables a home's energy performance to be calculated before it is built.

Mr. A. Harriott, Dartmouth

- During his ten years as Director of Maintenance and Operations with the Dartmouth District School Board, Mr. Harriott has spearheaded an energy conservation campaign. He has organized energy saving efforts and constantly urges teachers and staff to participate in energy conservation.

Mr. Dan Haycock, Dartmouth

- President of the Arena Managers Association of Nova Scotia, Mr. Haycock has continually encouraged energy-saving awareness of among ass ciation members, and was instrumental in producing a publication on energy management in arenas.

Honourable Mentions were awarded to Belmont House, Dartmouth; Econoler Ltd., Halifax; Sears Canada Inc., Dartmouth; Dartmouth Parks and Recreation Department; Halifax Forum Commission; Mount St. Vincent University, Halifax; St. Peter's Elementary School, Arichat; Stellarton Junior High School; and the town of Stellarton.

ENERGY ENGINEERING SECTION

A. Parker, Manager

INTRODUCTION

The Energy Engineering Section is responsible for the planning, execution and management of studies and projects related to energy management, fuel utilization and substitution, energy transmission and distribution and renewable energy resources. Energy Engineering provides services to help other sections with work projects and assists in long range planning and policy development.

ACTIVITIES

The majority of work during fiscal year 1987/88 was devoted to activities under MOU. Staff participated on three MOU sub-committees and acted as co-chairmen of the Renewables and Industrial/Commercial Sub-committees.

Projects for the Renewable Energy Sector included: studies of present barriers to increased use of wood energy, wood-fired hot water district heating, and small-scale wood chip harvesting operations; a training seminar for instructors of solar construction; monitoring of wood energy heating plants; and a geothermal test and demonstration project in Springhill, N. S., which will use geothermal heat from abandoned coal mines for a water source heat pump.

The Industrial/Commercial sector projects included: technology transfer of six energy demonstration projects; a demonstration of computer room waste heat recovery using heat pumps; an in-house diesel co-generation study; a high rate anaerobic digester study; and a proposal for the demonstration of variable frequency electric motor drives.

In addition, staff assisted the Canadian Electrical Association, through the Nova Scotia Power Corporation (NSPC), with the development of a seminar/ workshop on high efficiency motors and electric variable speed drives. Staff also gave technical support to the transportation and residential energy conservation sectors.

The Section which assisted provided a substantial amount of information and advice which assisted helped in policy decisions, and helped intergovernmental groups. For example, staff gave technical assistance to the Select Committee of the Legislature on Forestry, Woodchip and Biomass; this Committee released its final report in May, 1987, strongly supporting the increased use of wood energy in the province. Staff also helped to prepare a brief on wood energy, which the Atlantic Provinces Forestry and Energy Ministers submitted to the federal government.

During the year, staff continued to complete pre-feasibility analyses of potential wood fuel conversion sites on behalf of the Interdepart- mental Committee; which was formed to examine the use of wood energy in Nova Scotia's institutional sector. The work of this Committee provided information and analyses for the decision to convert the Nova Scotia Agricultural College and the new Valley Regional Hospital, as well as several smaller sites, to wood energy.

The Section also provided information and administrative support to a consultant's study, which compared the cost of coal-generated electricity at the NSPC's newest operating electrical generating station with the cost of a possible 20-megawatt, wood-fired electrical generating plant located in the Digby area. The results of the study showed coal-generated electricity to be less expensive.

Staff continues to monitor technology developments which could affect energy production and use in Nova Scotia. The Section collected information on biomass and coal combustion systems, on solar heating, solar photovoltaic and wind energy systems.

ENERGY PROGRAMS SECTION

J. Gordon, Manager

INTRODUCTION

The goal of the Energy Programs Section is to promote the efficient and appropriate use of energy within the province. This is achieved through the provision of various conservation and fuel substitution programs to all sectors.

Three main working groups comprise the Energy Programs Section; the Provincial Energy Analysis Program (PEAP), Residential Energy Programs and the Energy Education Program.

PEAP provides on-site energy analyses to provincial and municipal government facilities. The program provides follow-up technical advice on the implementation of energy management measures recommended by these analyses. Upon request, PEAP also provides preliminary investigation of retrofit opportunities for small industries and commercial facilities.

Residential Energy Programs provides information and motivational programs on residential and transportation energy use. This group is responsible for monitoring and addressing significant residential and transportation energy conservation issues, as well as assessing and surveying public attitudes toward energy. The group also organizes the annual Nova Scotia Energy Awards.

The Energy Education Program carries out a variety of educational and outreach activities, often in co-operation with other departments, groups or associations.

RESIDENTIAL ENERGY PROGRAMS

Each year the Residential Energy Programs group receives thousands of requests from the public for advice and information. The Enerinfo phone line (1-424-5727) — a province-wide, toll-free advisory service — accounted for over 1800 information requests during the fiscal year. Written requests, referrals from other agencies, responses to the Section's promotional material, and enquiries resulting from the Enerinfo display at home and energy trade shows also accounted for a significant volume of responses. Information provided ranged from general to extremely specific, and covered such topics as ventilation and moisture problems, heating systems, air sealing, new home construction and vehicle fuel economy.

The group provides seminars on topics such as heating, air sealing, insulation, condensation and heating system upgrading. Staff also responds to

requests for site inspections of buildings and heating systems where major problems are being experienced. There were 41 inspections, with subsequent recommendations, during this fiscal year. Clients included the Lunenburg County Housing Authority; the Salvation Army, Amherst; Northend Day Care Centre, Halifax; and the Royal Nova Scotia Yacht Squadron.

Staff prepared *Understanding Hydronic Heating Systems*, a 44-page manual on residential oil-fired hot water heating, for the Northeast International Committee on Energy at the Conference of New England Governors and Eastern Canadian Premiers.

Residential Energy Programs also provided advice on energy conservation to other government departments and agencies. During fiscal year 1987/88, staff was consulted by the Nova Scotia Department of Consumer Affairs, Nova Scotia Department of Housing, Nova Scotia Department of Tourism and Culture (Heritage Buildings), and the Nova Scotia Power Corporation for assistance on residential energy issues.

Group members also made a major effort towards implementing energy-related programs and activities under MOU through the Transportation, Communications and Existing Housing Sub-committees.

Federal-provincial initiatives included: the writing and distribution of *Energy Adviser*, a 16-page technical bulletin for renovators, energy contractors, suppliers and government officials, published three times in fiscal year 1987/88; the production of pamphlets on energy conservation in housing, and their distribution to consumers through literature displays at 111 building supply and hardware stores; and an energy conservation advertising campaign promoting the Enerinfo telephone advisory service. The final report of a survey of public attitudes towards energy was also received.

A study of interior moisture problems was conducted, resulting in inspections and reports for 94 homes and the provision of information on moisture and ventilation to an additional 191 homeowners.

Financial support was provided for the Municipal Air Sealing Project; involving a joint venture with Cape Breton County municipalities and the Canada Employment and Immigration Commission to air seal 90 homes belonging to low-income owners.

Work on the Public Housing Air Sealing Project was completed. More than 90 public housing units in New Glasgow and Yarmouth were draftproofed. Ventilation equipment was installed in 15 units experiencing moisture and other ventilation problems. This follows similar work at public housing authorities in Halifax and Sydney during fiscal year 1986/87.

A video-lending library was established and copies of more than 200 tapes on residential retrofit were borrowed. A brochure promoting the service was produced and distributed.

The retrofit of a heritage home in Yarmouth County was completed, in co-operation with the Department of Tourism and Culture, to demonstrate energy conservation improvements to older housing.

Several transportation initiatives were undertaken. In the Pro-Fisher Program, a series of 15 seminars on fuel economy for inshore fishermen was held in February and March, 1988. Information materials, seminars, and advice on vehicle fuel economy were provided to the commercial trucking industry under the Pro-Trucker Program. Residential Energy Programs also held a fuel economy competition for ten media representatives in co-operation with Shell Canada, Chrysler Canada and Metro Transit, and sponsored a car economy rally at West Kings District High School, Auburn.

Staff represented the Department on numerous committees, including those of the Canadian Wood Energy Institute, the R-2000 Regional Marketing Committee, the Canadian General Standards Board's National Advisory Panel on Standards for Building Performance and the Nova Scotia Chapter of Society, Environment and Energy Development Studies (SEEDS).

ENERGY EDUCATION PROGRAM

The Energy Education Program creates an awareness of efficient energy use and appropriate fuel substitution among youth and educational audiences. The primary focus of the Program has been in-class presentations to students in grades primary through twelve, supplemented by student and teacher resource materials.

During fiscal year 1987/88 staff made 491 presentations to over 33 400 students in 173 schools. The number of student contacts remained constant, while 18 additional schools were visited. Learning resource materials and student activity sheets for elementary school children were prepared and distributed.

A video of the presentation program was prepared and shown at the National Energy Educators Meeting in Edmonton, Alberta in November, 1987.

Staff developed energy resource materials of particular relevance to the supply and utilization of energy in the province, including *Nova Scotia Energy Resources, A Booklet for Secondary Schools*. A Nova Scotia Energy Calendar for senior and junior high school classrooms was prepared and distributed as part

of the staff's participation on SEEDS. A draft of a provincial map citing significant energy projects and events was proposed and accepted as a future SEEDS project.

PROVINCIAL ENERGY ANALYSIS PROGRAM

The Provincial Energy Analysis Program (PEAP) provides on-site, computer-based energy analyses to public buildings such as hospitals, schools, provincial facilities and municipal buildings.

During the period of April 1, 1987 to March 31, 1988, 271 energy analyses were conducted in buildings which had a combined annual energy bill of $5,793,789. Energy efficiency improvements were identified in these buildings, which would reduce annual energy costs by $662,053 or 11.4 per cent. A summary of energy analyses results for fiscal year 1987/88 is provided in Table 7.

Substantial post-audit services to government clients were also provided. These services involved assisting with the costing and planning of energy efficiency measures and providing technical information. Staff routinely surveyed clients to document energy conservation improvements and to evaluate the subsequent energy savings.

With the increasing complexity of energy-related building systems, and the limited technical training of most building operators, many systems are improperly operated and maintained, resulting in significant energy inefficiencies. As a first step in addressing this problem, a training course was developed for school building operators. This was undertaken in co-operation with the Departments of Education, Government Services and Advanced Education and Job Training. The concept for this pilot project is to include energy management principles with a course on the basic operation and maintenance of building systems which impact energy consumption. There is considerable potential for applying this concept to schools and other public buildings.

Development work began on a computerized energy accounting system for provincially-funded public buildings, which will facilitate the monitoring of energy consumption and energy costs. Additional uses for the accounting system include: providing a source of information for internal energy planning; increasing energy management awareness and effectiveness of public building owners, operators and users; and responding to outside requests for energy use statistics. The system will be in operation by the fall of 1988.

Program staff also provided a number of additional energy advisory services, mainly related to the dissemination of energy management information.

In addition, staff participated in the development and provision of a number of energy management seminars in co-operation with the Technical University of Nova Scotia. And staff represented the Department on the Nova Scotia Chapter of the federally-funded Commercial and Office Buildings Energy Management Task Force, as well as on MOU's Industrial/Commercial Sub-committee.

The Provincial Energy Analysis Program has been involved in drafting an energy cost reduction strategy for public buildings owned or funded by the province. The new strategy will address a number of issues related to increasing energy management activity. The objective is to reduce energy costs while maintaining environmental quality within public buildings.

TABLE 7. Provincial Energy Analysis Program

Number of Audits — **271**

	$	**kwh**
Total Energy Use	5,793,789	146,038,262
Average per site	21,379	538,262
Potential Savings	662,053	20,359,979
Per cent Savings	11.4	13.9

ECONOMICS AND STATISTICS DIVISION

Vicki Harnish, Director

INTRODUCTION

The Economics and Statistics Division has four primary responsibilities. These include:

- co-ordination of overall provincial energy planning activities
- provision of economic analysis and statistical and computer support services for the Energy Branch
- provision of policy advice on matters related to energy pricing, markets, transmission, resource procurement and availability
- making known the province's position on these matters to other levels of government and the private sector, sometimes through regulatory interventions.

The Division prepares reports, position papers, publications and computer models, and manages the preparation of studies by private consultants. Depending on the nature of the material, these studies are made available to other departments, the public, energy corporations and other governments and agencies.

CHANGES IN ORGANIZATION

The Energy Branch was reorganized in 1987-88 with the former Energy Management Division being split to form two Divisions, one retaining the name of Energy Management. The Economics and Statistics Section was given additional responsibilities and became the Economics and Statistics Division. These increased responsibilities include a broadening in the scope of activities, including the provision of computer support services to the entire Energy Branch. One staff member was transferred from the Energy Programs Section of the Energy Management Division to accommodate the extra workload.

The Division comprises two Sections — Economic Analysis, and Statistics and Computer Services — in line with the two main orientations of the Division.

Economic Analysis Section

The Economic Analysis Section is primarily responsible for overall energy planning, program evaluation, economic analysis and energy market monitoring.

The Section is required to develop policy alternatives for senior Department officials, to occasionally help draft legislation, and must sometimes intervene before regulatory authorities.

ACTIVITIES

The issue of free trade between Canada and the United States created a significant amount of activity in the Section both before and after the signing of the Free Trade Agreement. Comments were prepared concerning the potential impact of free trade on Department programs and other energy-related activities before the Agreement principles were announced in October, 1987. After the Agreement was tabled in the House of Commons in December, 1987, Section staff attended numerous briefings and prepared documents to identify and analyze the impact of the Agreement's energy provisions on the province's energy industry.

Section staff, along with personnel from the Energy Resources Division and the Department of the Attorney-General, participated in the redrafting of regulations to the Nova Scotia Pipeline Act. These revisions were required to incorporate new regulatory policies governing natural gas in Canada, as well as new technical specifications applicable to natural gas pipelines. Final regulations are expected in the summer of 1988.

With the creation of the new Division, the evaluation of programs and activities performed or planned by the Energy Branch became a major area of focus. The Division also became more involved in economic impact analysis; recognizing that decisions involving energy have a variety of important implications for the economy as a whole. This initiated a report called *"The Economic Impact of the Coal Industry in Nova Scotia"*. To carry out this task, staff were familiarized with the procedures and models required to perform the evaluation. Staff also collected extensive data. An initial draft report on the evaluation results has been completed, with the final report expected during the current fiscal year.

Section staff represented the Department on two international and interprovincial committees related to energy. One member served on the Planning Committee for the eighth annual Northeast International Committee on Energy Roundtable; another was appointed Chairman to the Interprovincial Advisory Committee's Energy Demand Restraint Sub-committee.

Other duties included responding on behalf of the Government of Nova Scotia to the federal government's "Energy Options" process; monitoring of ongoing developments in the regulation of Canadian and U.S. energy markets, and studying Northeast U.S. electricity markets and the potential for Canadian

exports. Support activities to other Department Divisions included an evaluation of the effects of federal tax reform on the energy and mining sectors, and a clarification of the economic impact of woodchip harvesting. Section staff also prepared various briefing notes, ministerial briefing books and speeches for senior Department officials.

In September, 1987, the Board Commissioners of Public Utilities conducted hearings on oil company applications for increased product prices. The Division provided analytical support for the province's submission to the hearings. Petroleum product prices were allowed to rise by 2.2 cents L in October; however, no further increase was permitted despite the requests of some oil companies in subsequent reports.

Statistics and Computer Services Section

The Statistics and Computer Services Section is responsible for energy database development and maintenance, analysis and dissemination of statistics, and the provision of energy demand and price forecasts. The Section's other major responsibility is to provide computer software and hardware expertise to the Branch, as well as technical advice on computer equipment selection and the development of in-house programs.

A major focus has also been the updating of Nova Scotia's 1985 long-term energy, demand forecasting model. Large portions of this end use model were refined to more accurately reflect the Nova Scotia energy market, and databases were updated to include the latest available information. The Section began work on a new energy demand forecast; the residential sector forecast has been completed, indicating a significant increase in energy demand throughout the forecast period. It is expected that a forecast of the province's overall energy requirements for the next 22 years will be completed in 1988.

Considerable effort was directed towards creating new databases as well as expanding, upgrading and updating existing ones used to carry out the Division's day-to-day activities. The main focus was to improve the province's data on coal production and sales. This data will be updated on a regular basis and will prove to be a very useful source of common information, not only for government but for the industry itself.

On-going duties of a statistical nature included the publication of an information sheet on energy supply and demand, and prices of coal, electricity and petroleum products in the province. A new feature was added to the monthly report, providing a summary of leading economic indicators and comments of economic interest. The annual *Energy Statistical Profile* for 1987 was updated for publication in 1988.

Due to the Department's large scale integration of computers, the Division has played a key role in the development of a Long Range System Plan for computer equipment within the Energy Branch. Several microcomputer systems are already used for a wide variety of applications, with the long term goal being the networking of all computers within the Department. It is hoped that this plan will bring about the integration of computers in a cost-efficient manner with little or no disruption to staff and procedures.

Also in 1987-88, Division members attended several training courses to familiarize themselves with the new. They, in turn, passed this training on to other members of the Branch. Several new software packages have been introduced to staff, including Freelance Plus and Manuscript. With the wealth of data being stored on computer disks within the Division, precautionary measures were taken to produce duplicates of all the data on file for storage in another facility.

Through the reorganization of the Division, a staff member was transferred to the new Division to assist in the Section's computer services. The Section provided programming support to the Provincial Energy Analysis Program, and prepared database programs to handle data generated by the Enersave and Small Business Programs. Once completed, the database was transferred from the Data General to an IBM system.

ADMINISTRATION DIVISION

C.R. James, CMA, Director

The Administration Division provides the Department with financial, operational and personnel management. It also supplies cartographic and administrative services to the Department and accounting services to Novaco Limited. The Director is Secretary-Treasurer of this crown corporation.

Under the Department Budgetary System, the Administration Division consists of the Offices of the Minister and Deputy Minister, Energy Branch Administration, Mines and Minerals Branch Administration, and the Administration Division.

The duties and functions of the Division are divided into five sections: Accounting Services, Mineral Taxation and Fiscal Planning, Personnel and Administration, Cartography and the Co-ordination of the Department's Management Information System.

The Administration Division is responsible for mineral and petroleum resource revenue administration policy, the collection of mineral royalties and taxes, and the management and evaluation of government-funded coal mine and coal miner assistance programs.

Accounting Services Section

Ken Faulkner, CMA, Section Manager

The Accounting Services Section provides managerial and financial accounting and performs statistical services for the Department.

The Section is responsible for maintaining and updating the computerized departmental accounting system, which provides internal control by recording and reporting expenditures monthly. The Management Information System provides a monthly and year-to-date report of expenditures compared to the department budget. These reports are circulated to Section Managers monthly, and contribute in a large measure to the Department's success in maintaining expenditures within budget authority. Budgeting responsibility and Department administration is co-ordinated by this Section. It provides historical background, financial information and interpretation assistance to Budget Managers.

Two Coal Miners' Assistance Programs, the DOSCO (1923) pension and the Independent Coal Miners' Pre-Retirement Leave Plan, are administered by the Department but funded by the Department of Finance. As of March 31, 1988, 31 former miners were receiving the DOSCO (1923) pension and 59 were receiving Pre-Retirement Leave benefits.

Mineral Taxation and Fiscal Planning Section
Blair McMullin, Manager

The Mineral Taxation and Fiscal Planning Section is responsible for resource revenue policy and administration of mineral royalty and tax legislation. This Section also administers the Coal Mine Investment Security Program.

The Section also provides accounting services for Novaco Limited, a provincial crown corporation.

MINERAL ROYALTIES AND TAXES

This Section proposes legislative amendments and manages the royalty and tax provisions of the Mineral Resources and Gypsum Mining Income Tax Acts.

The revenue from royalties and taxes reported by the Department are shown for a 20-year period in Figure 12 and for the current fiscal year in Table 8.

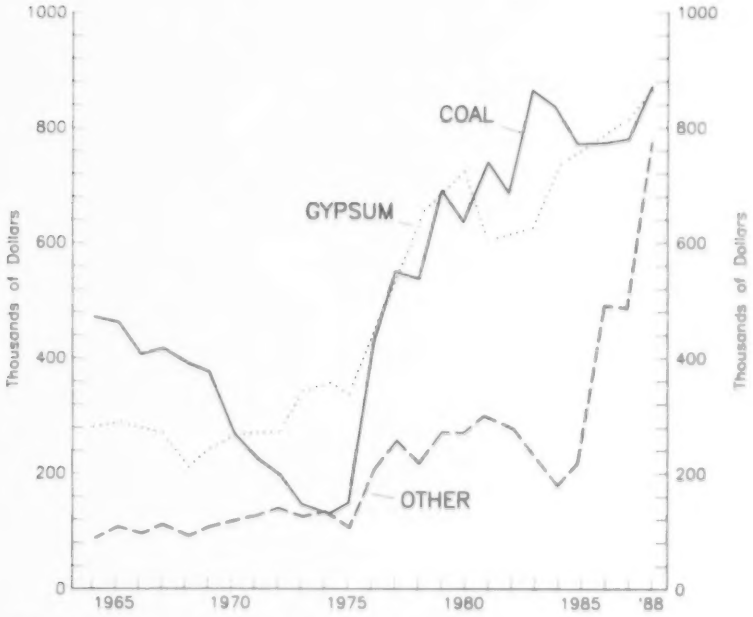


FIGURE 12. Historical trends of royalties and taxes.

TABLE 8. Royalties and taxes for the fiscal year ended March 31, 1988

Commodity	Royalty or Tax
Gypsum	$ 862,959
Coal	872,395
Salt	203,652
Other	584,425
Total	**$2,523,431**

COAL MINE INVESTMENT SECURITY PROGRAM

The Coal Mine Investment Security Program provides assistance to Evans Coal Mines Limited, St. Rose, Inverness County. The progam is designed to promote self-sufficiency through operational efficiency and increased productivity. The operator is protected against major losses that could result from extended periods of low output.

NOVACO LIMITED

The Section administers the accounting control function of this crown corporation. Management information is provided on a monthly basis.

Personnel and Administration Section
P. Edwards, Manager

This Section provides advice and support on personnel management to all Department Divisions. The responsibilities of the Section include recruitment, staff relations, compensation, establishment and maintenance of performance appraisal systems, career development training, personnel and payroll documentation, and the maintenance of employee records. The Section is also responsible for the continual upgrading of office and administrative services for the Department.

The Section's university employment program provided summer jobs for 74 students. Nine people were employed under the provincial Summer Employment Program.

During the year, the Section provided support in recruiting staff to work on programs related to the CNSMDA.

In consultation with the Department of Government Services and the Civil Service Commission, work continued on the implementation of a computerized, leave processing system. The system is designed to record transactions associated with leave from the work place, and to report on these transactions either through terminals or microcomputers as well as ad-hoc reporting. Consideration was also given to computerizing the Section's Central Registry operations. The function of the Central Registry includes department file creation, maintenance, retention and disposal.

A modified work week program has been proposed for implementation in 1988-89. The proposal would allow eligible employees to extend daily hours of work in exchange for time off at a later date, subject to managerial approval.

Staff attended various in-service and external courses and programs; covering areas such as management and supervisory development, communication skills, clerical/secretarial development and occupational health and safety.

Personnel changes are shown in Table 9.

TABLE 9. Personnel changes during the 1987/88 fiscal year

APPOINTMENTS	SEPARATIONS
Elaine Limpert	Leslee Hughes
Barbara DeLory	Ann Caldwell
Harry Avery	Prabha Chopra
Arthur Ferguson	Patrick Hanson
Yvonne Brown	Stan Chesal
Stephanie Douma	Jennifer Bates
Fred Boner	Cheryl Dobson
Jill Cumby	
Cheryl Dobson	
Udeni Amit	
Terry Tomney	**TRANSFERS**
Greg Haverstock	
Shirley Hazen	Chris Moir
Delene Provencal	Lila Demone
Dawn McDonald	
Donald Jones	

Computer Systems Section
Tim Bateman, MIS Co-ordinator

During the year, this Section was established planning, development, promotion implementation and monitoring of the Department's EDP systems.

The co-ordinator of computer systems provides technical support to the EDP Management Planning Committee and is Chairman of the working group. The co-ordinator is the principal contact for Management Board and the Department of Government Services on all EDP matters. The co-ordinator is also responsible for the development and yearly revision of the Department's Long Range Systems Plan.

Cartographic Section
Joe Campbell, Manager

The Cartographic Services Section provides both drafting and photographic services for all Divisions of the Department. The drafting component is responsible for the production of a wide variety of geological and energy-related drawings for use in publications and visual presentations.

The photographic unit is responsible for the reproduction of material for publication purposes, field photography, slides for lecture purposes and display photographs.

A large percentage of the drafting and photography completed in the past year was for personnel hired through the CNSMDA.

FINANCIAL INFORMATION

INTRODUCTION

The Department of Mines and Energy had 182 people on staff as of March 31, 1988. During the 1987/88 fiscal year, the Department administered forecast expenditures of $12,610,900 while recovering $2,267,700 from various funds. Royalties and mining taxes, as reported in Table 8 were $2,523,431. The licences and fees were $723,768 for total revenue of $3,247,199.

Expenditure information is presented in Table 10 under three headings. "Operations and assistance" are budgeted in the Department. "Other" includes expenditures budgeted under a Public Service Vote and through the Department of Development.

"Operations" information is presented by budget subject title in separate Divisions.

"Assistance" information is presented by budget subject title under two sectors: Coal Industry and Energy.

"Other" information is presented by the legislative vote title or the department where the funds have been budgeted.

As expenditure information provided was drawn from the publications *Estimates of the Government of Nova Scotia* and *Public Accounts of the Province of Nova Scotia*, the subject titles may differ from the sectional titles drawn from the Department Organization Chart.

TABLE 10. Financial information about the Department of Mines and Energy

Division Activity Budget Subject Title	Actual Expenditure 1986-87	Estimate 1987-88	Final Forecast 1987-88
OPERATIONS			
ADMINISTRATION DIVISION			
1. Office of the Minister and Deputy Minister	$ 341,317	$ 466,000	$ 446,700
2. Accounting, Personnel and Administration	461,549	610,300	544,200

TABLE 10. Continued

Division Activity Budget Subject Title	Actual Expenditure 1986-87	Estimate 1987-88	Final Forecast 1987-88
3. Cartographic Services	259,323	338,800	332,100
4. Energy Branch Administration	285,108	376,600	307,900
5. Mines and Minerals Branch Administration	379,777	427,200	420,200
TOTAL Administration Division	$1,727,074	$2,218,900	$2,051,100
ENERGY MANAGEMENT DIVISION			
1. Provincial Energy Analysis	$ 398,796	$ 333,200	$ 323,000
2. Energy Planning & Statistics	349,448	532,800	398,700
3. Energy Advisory Services	351,835	509,000	482,200
4. Energy Engineering	199,112	235,000	198,600
5. National Conservation and Alternative Energy Initiatives	222,924	1,075,000	400,000
TOTAL Energy Management Division	$1,522,115	$2,685,000	$1,802,500
ENERGY RESOURCES DIVISION			
1. Petroleum Resources	$ 437,242	$ 560,700	$ 477,400
2. Coal Exploration	238,958	294,600	256,400
3. Coal Development and Utilization	163,727	172,600	169,500
TOTAL Energy Resources Division	$839,927	$1,027,900	$903,300
DRILL AND MECHANICAL DIVISION			
1. Drilling Services	$ 591,910	$ 597,200	$ 643,900
2. Operations & Maintenance	271,332	324,500	316,400
TOTAL Drill and Mechanical Division	$ 863,242	$ 921,700	$ 960,300

TABLE 10. Continued

Division Activity Budget Subject Title	Actual Expenditure 1986-87	Estimate 1987-88	Final Forecast 1987-88
MINING ENGINEERING DIVISION			
1. Mining Engineering	$ 199,373	$ 222,600	$ 192,800
TOTAL Mining Engineering Division	$ 199,373	$ 222,600	$ 192,800
MINERAL RESOURCES DIVISION			
1. Mineral Resource Evaluation	$ 262,393	$ 233,300	$ 237,800
2. Regional Surveys	313,990	328,000	336,900
TOTAL Mineral Resources Division	$ 576,383	$ 561,300	$ 574,700
MINERAL DEVELOPMENT DIVISION			
1. Resource Geology	$ 139,181	$ 153,000	$ 146,400
2. Regional Exploration Services	204,365	215,500	213,500
3. Library Services	148,667	196,400	213,000
4. Mineral & Petroleum Titles	101,996	107,300	103,200
TOTAL Mineral Development Division	$ 594,209	$ 672,200	$ 676,100
TOTAL OPERATIONS	$6,322,323	$8,309,600	$7,160,800
ASSISTANCE PROGRAMS			
COAL INDUSTRY ASSISTANCE			
1. Coal Miners' Assistance	$ 396,346	$ 434,300	$ 402,000
2. Coal Development — Novaco	225,000	75,000	75,000
3. Coal Mines Investment Security Program	32,835	156,000	156,000

TABLE 10. Continued

Division Activity Budget Subject Title	Actual Expenditure 1986-87	Estimate 1987-88	Final Forecast 1987-88
TOTAL Coal Industry Assistance	$654,181	665,300	633,000
ENERGY ASSISTANCE			
1. Coal Liquefaction	$ 249,936	$ 250,000	$ 250,000
2. Oil Substitution	1,079,819	1,350,100	1,017,100
TOTAL Energy Assistance	$1,329,755	$1,600,100	$1,267,100
TOTAL ASSISTANCE	$1,983,936	$2,265,400	$1,900,100
OTHER PROGRAMS			
1. Mineral Subsidiary Agreement Budgeted in Department of Development	$3,186,213	$3,823,000	$3,550,000
TOTAL OTHER	$3,186,213	$3,823,000	$3,550,000
TOTAL EXPENDITURES ADMINISTERED BY DEPARTMENT OF MINES AND ENERGY	$11,492,472	$14,398,000	$12,610,900

LEGISLATION

INTRODUCTION

The Nova Scotia Department of Mines and Energy receives its mandate from the *Public Service Act.* This Act provides for a Department of Mines and Energy and the appointment of a Deputy Minister. It also provides for the function of the Department and its employees.

The following Acts are administered by the Department of Mines and Energy:

Mineral Resources Act S.N.S. 1975, c.12.

The *Mineral Resources Act* governs the disposition of mineral rights for exploration and development, administrative procedures, resources management requirements and royalties. Stone, sand, gravel, peat, gypsum, non-crown limestone, oil, gas and oil shale fall outside this Act. Coal, salt, potash and uranium may only be worked under license by Order of the Governor in Council. There is a moratorium on all uranium exploration activity in the province.

Treasure Trove Act R.S.N.S. 1967, c.314.

The *Treasure Trove Act* regulates the exploration for precious stones and metals in a state other than their natural one. Requirements for exploration and royalties are provided by Order of the Governor in Council.

Coal Mines Regulation Act R.S.N.S. 1967, c.36.

The *Coal Mines Regulation Act* governs operation and safety in provincial coal mines. Coal mines operated by the federal government through crown corporations, such as the Cape Breton Development Corporation, are inspected and regulated under the Canada Labour Code. Provincial coal mines are inspected Nova Scotia Department of Labour inspectors.

Gas Storage Exploration Act S.N.S. 1970, c.6

The *Gas Storage Exploration Act* governs exploration and development of underground storage for liquid or gaseous petroleum products.

Metalliferous Mines and Quarries Regulation Act R.S.N.S. 1967, c.183.

The *Metalliferous Mines and Quarries Act* governs operation and safety in mines and quarries that are not otherwise covered by the *Coal Mines Regulation Act.*

Quarries operated by the Department of Transportation do not fall under this Act. Inspections are performed by the Nova Scotia Department of Labour.

Gypsum Mining Income Tax Act R.S.N.S. 1967, c.122

The *Gypsum Mining Income Tax Act* provides reporting procedures and mining tax formulae for gypsum mining operations in the province.

An Act to Confer Certain Powers Upon the Lieutenant Governor-in-Council and to Amend the Mines Act S.N.S. 1918, c.16

Certain powers are conferred on the Lieutenant Governor-in-Council for the purpose of maintaining an acceptable level of stability in the Coal Mining Industry. The Act provides authority for a subvention program for independent coal mine operators, a pre-retirement leave program, a coal waste dumps reclamation project, and operation of Novaco Limited.

Petroleum Resources Act S.N.S. 1980, c.12.

The *Petroleum Resources Act* came into force July 28, 1984, and it regulates the administration and distribution of petroleum rights in Nova Scotia.

Energy and Mineral Resources Conservation Act S.N.S. 1980, c.5.

The *Energy and Mineral Resources Conservation Act* provides authority to establish an Energy Board to hear matters arising out of such Acts as the *Gas Utilities Act, Pipeline Act,* etc. The Governor-in-Council may amend the (S.N.S. 1984, c.60) application of this Act and may designate the Public Utilities Board of Commissioners as the Energy Board. This Act, and the amendment, came into force July 28, 1984.

Gas Utilities Act S.N.S. 1980, c.7.

The *Gas Utilities Act* regulates the process wherein an applicant may seek and obtain approval to operate a gas utility. By amendment (S.N.S. 1984, c.60), the Act may be limited to certain geographic areas and certain operations. The Act and amendment came into force July 28, 1984.

Pipeline Act S.N.S. 1980, c.13.

The *Pipeline Act* regulates all aspects of transmission of oil and gas. The Act may be limited to certain transmission lines and certain geographic areas, as provided for in S.N.S. 1984, c.65. The Act and amendment came into force July 28, 1984.

Canada-Nova Scotia Oil and Gas Agreement Act S.N.S. 1984, c.2.

The *Canada-Nova Scotia Oil and Gas Agreement Act* mirrors the federal legislation implementing and giving effect to the Canada-Nova Scotia Agreement on Offshore Oil and Gas Resources Management and Revenue Sharing, providing the framework for administration and regulation of offshore oil and gas exploration and production.

Offshore Oil and Gas Act S.N.S. 1984, c.8.

The *Offshore Oil and Gas Act* mirrors federal offshore legislation. This Act, along with the federal counterpart, regulates acquisition and disposition of offshore oil and gas rights. Crown share, Canadian ownership rates, transfers and other matters are also addressed.

Oil and Gas Production and Conservation (Nova Scotia) Act S.N.S. 1984, c.9

Exploration, drilling, development and production of oil and gas in the offshore are regulated by the *Oil and Gas Production and Conservation (Nova Scotia) Act* and its federal counterpart.

Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation (Nova Scotia) Act S.N.S. 1987, c.3 This act will be available upon proclamation.
Unproclaimed

Offshore Petroleum Royalties Act S.N.S. 1987, c.9
Unproclaimed

Offshore Petroleum Resources Act S.N.S. 1987, c.8
Unproclaimed

Oil and Gas Production and Conservation (Nova Scotia) Act S.N.S. 1987, c.10
Unproclaimed

Please note that once proclaimed, the above acts will implement the offshore accord and will repeal the existing provincial offshore legislation.

APPENDIX A

PUBLICATIONS

INFORMATION CIRCULARS

No. 8	Staking claims in Nova Scotia; Nova Scotia Department of Mines and Energy, 1987.	FREE
No. 9	A Walking Tour of Rocks, Minerals and Landforms of Peggy's Cove, by Anita Sampson and Howard Donohoe, 1987.	FREE
No. 10	A Walking Tour of Rocks, Minerals and Building Stones along Spring Garden Road, Halifax, by Katherine Bishop, Anne Stevenson, Martha Devanney and Howard Donohoe, 1987.	FREE
No. 11	A Walking Tour of Rocks, Minerals and Landforms of Victoria Park, Truro, by Howard Donahoe and Martha Devanney, 1987.	FREE

INFORMATION SERIES

No. 13	Gold in Nova Scotia, by Jennifer Bates, 1987, 35 pages.	$5.00

MAPS

Map 87-1	Glacial Geology Map of Mount Uniacke (11D/13 West) by P. W. Finck and R. M. Graves, 1987, scale 1:500 000.	$6.00
Map 87-2	Glacial Geology Map of Halifax and Sambro (11D/12 and 11D/05) by P. W. Finck and R. M. Graves, 1987, scale 1:50 000.	$6.00
Map 87-3	Till Clast and Simplified Glacial Geology Map of Mount Uniacke (11D/13 West), by R. M. Graves and P. W. Finck, 1987, scale 1:50 000.	$6.00
Map 87-4	Till Clast and Simplified Glacial Geology Map of Halifax-Sambro (11D/12 and 11D/05), by R. M. Graves and P. W. Finck, 1987, scale 1:50 000.	$6.00
Map 87-6	Bedrock geological map of Halifax and Sambro (11D/12 and 11D/05), by M. A. MacDonald and R. J. Horne, 1987, scale 1:50 000.	$6.00

Map 87-7	Bedrock geological map of Windsor (21A/16 East), by L. J. Ham and R. J. Horne, 1987, scale 1:50 000.	$6.00
Map 87-8	Bedrock geological map of Mount Uniacke (11D/13 West), by M. C. Corey, 1987, scale 1:50 000.	$6.00

MISCELLANEOUS PUBLICATIONS

MP 87-1	Nova Scotia Oil and Gas Report 1987.	$2.00

OPEN FILE MAPS

OFM 87-004	Preliminary geology map, New Germany (21A/10), by R. Horne, scale 1:50 000.	$2.00

OPEN FILE REPORTS

OFR 87-002	Market Analysis for New Brunswick, Nova Scotia and Newfoundland Dimension Stone, by the DPA Group Inc. in association with Jacques Whitford & Associates Ltd., March 1987, 66 pages.	$10.00
OFR 87-005	Report on the Potential Stone Quarry MacKenzie Farm, Harwood Hill, Pictou County, N.S. By G. Dickie, 1986, 37 pages.	$5.00
OFR 87-023	Report on the English Property (McKeen Quarry), Pictou County, by G. B. Dickie, 1987, 12 pages.	$5.00
OFR 87-027	Potential Crushed Stone Deposits on Tidewater in Nova Scotia, by G. B. Dickie, 1987, 15 pages.	$5.00
OFR 87-032	Sulphur in Nova Scotia: Pugwash and Hilden Occurrences, by D. C. Carter, R. C. Roehner, and G. C. Adams, 1987, 7 pages.	$5.00

REPORTS

Report 87-1	Mines and Minerals Branch, Report of Activities, 1986, 270 pages. (Microfiche $3.00)	$15.00
Report 87-2	Gold in Nova Scotia: A Bibliography of the Geology, and Exploration and Mining Histories from 1832 to 1986, by Janet Gillespie-Wood, 1986, 500 pages. (Microfiche $3.00)	$25.00

Report 87-3	Index on Assessment Reports, Publications, Open File Reports and Open File Maps for 1986, by N. A. Lyttle and J. Gillespie-Wood, 1987, 277 pages. (Microfiche $4.00)	$20.00
Report 87-4	Drilling Logs of Government Core Drills, 1986, compiled by C. Kavenaugh, 1987, 64 pages. (Microfiche $2.00)	$5.00
Report 87-5	Report of Activities 1987, Part A, 180 pages. NOTE: Report of Activities, Part A, supersedes Program and Summaries of the Information Series.	$7.00

APPENDIX B

PRODUCTION INFORMATION FROM MINES, QUARRIES AND OTHER OPERATIONS

The mining industry in Nova Scotia directly employed more than 5926 people (Fig. B-1). The value of the materials produced was in excess of $441.4 million (Fig. B-2). Values of mineral commodities produced in Nova Scotia have increased continually over the last decade (Fig. B-3).

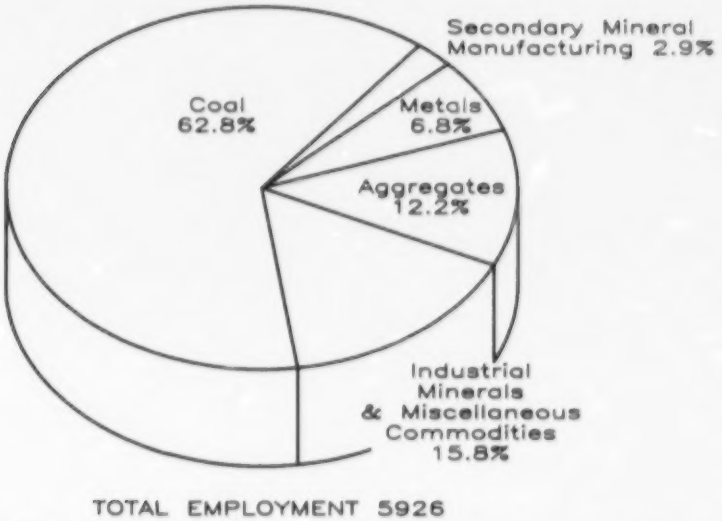


FIGURE B-1. Mineral commodity employment as a percentage of the total employment.

In this appendix each production site is described and located. Tables B-1 to B-5 summarize the production figures for each commodity or mineral. Site locations are shown on the accompanying maps, Figures B-4 to B-5. Production data is for the calendar year January 1, 1987, to December 31, 1987.

METAL AND GOLD MINING

Gold

The gold mining sector was very active in 1987. Several companies obtained permits for extracting bulk samples of ore and conducted milling tests

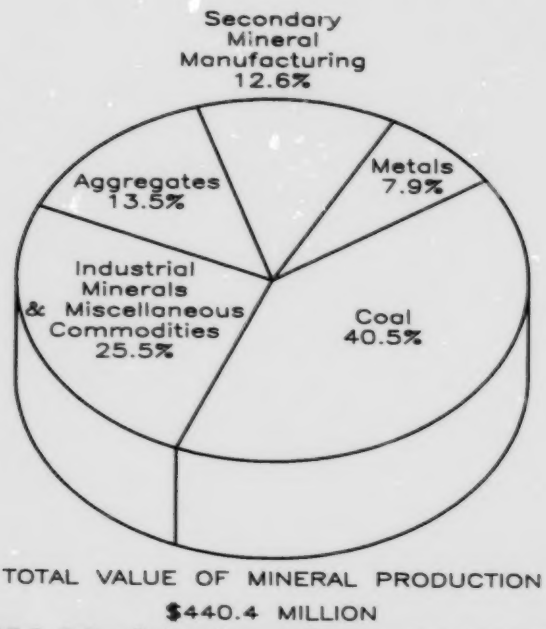


FIGURE B-2. Value of mineral commodity groups as a percentage of the total mineral production.

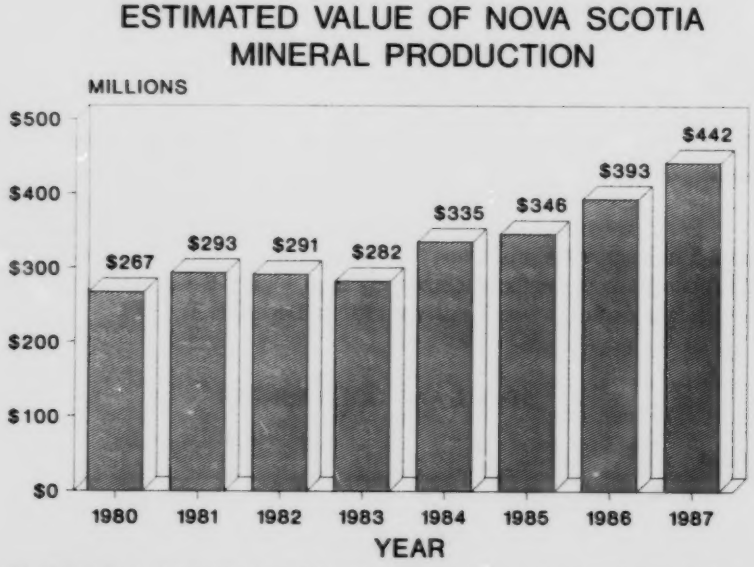


FIGURE B-3. Historical trend in value of unprocessed mineral production.

to assess ore grades and gold recovery. Two operators reported gold production from bulk sample tests — Seabright Resources Inc. with 111 727 g. and Edgar Horne with 595 g.

Metal Mines

The open pit tin mine at East Kemptville, operated by Rio Algom Tin Corporation, is the province's only base metal producer. Details of the operation follow below. The location is shown on Figure B-4 and production in Table B-1.

RIO KEMPTVILLE TIN CORPORATION

Manager:	K. Collison, PEng
Address:	P. O. Box 6, East Kemptville, N. S. B0W 1Y0
Production:	3 467 t tin in concentrate 251 t copper in concentrate 431.8 kg silver in concentrate
Employees:	225

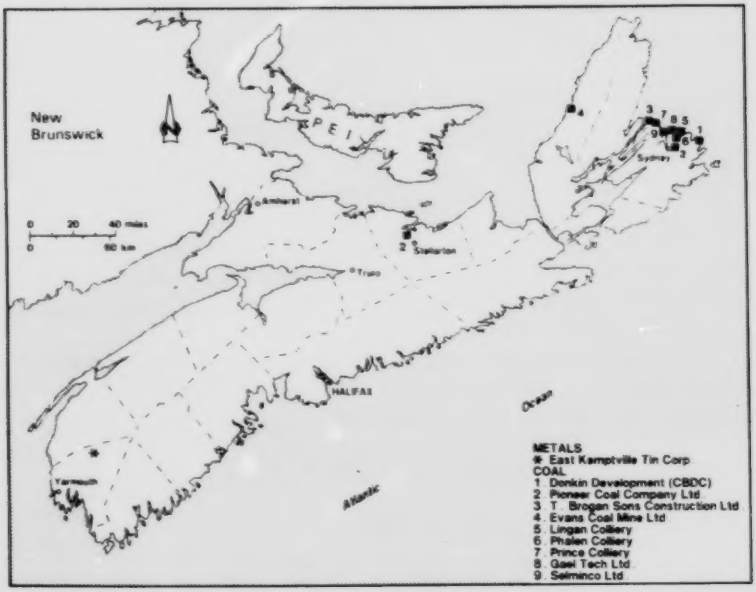


FIGURE B-4. Locations of metal and coal mines.

In November, 1986, Rio Algom Limited allowed ownership of the East Kemptville open pit tin mine and concentrator to pass to the consortium of banks which had financed the project.

In 1987, Rio Algom repurchased the project from the banking consortium. The name of the operating company was changed to Rio Kemptville Tin Corporation which is wholly owned by Rio Algom Ltd.

Ongoing metallurgical research is gradually improving the tin recovery which is now approaching its designed level.

COAL MINING OPERATIONS

In April, 1987, there were four underground coal mines, three open pit mines and three coal dump reclamation plants in operation. Table B-2 summarizes production information for these coal mines. The location of these operations is shown in Figure B-4.

Two of the coal dump reclamation plants closed in 1987.

Underground Coal Mines

EVANS COAL MINES LTD.

Manager:	G. Evans
Address:	R.R. #1, Inverness, N. S. B0E 1N0
Production:	34 515 t coal
Employees:	45

The St. Rose Colliery, Inverness County, is owned and operated by Evans Coal Mines Ltd. The entire production is either from development headings or by room and pillar mining, followed by pillar recovery.

The company is experiencing a problem with increased quantities of water entering the mine. The situation is being investigated by consultants to determine the source of the water so it can be sealed off.

CAPE BRETON DEVELOPMENT CORPORATION

Manager:	Robert Cooper, PEng Vice President, Mining Operations
Address:	P. O. Box 2500, Sydney, N. S. B1P 6K9
Production:	2 725 684 t coal
Employees:	3 546

The Cape Breton Development Corporation (CBDC) is a federal crown corporation that operates three producing underground coal mines in the province. The Corporation has suspended the development of the Donkin Mine for an indefinite period.

Lingan Colliery

This mine is located at Lingan, near New Waterford. Coal is recovered by a fully-mechanized, advance longwall method.

Longwall 6W finished on the 19th of September and 9E finished on the 19th of December. Longwall 10E worked all year. Longwall 7W started production on the 4th of July.

Phalen Colliery

The Phalen Colliery commenced production in 1987. The coal is extracted by a fully-mechanized retreat longwall method. The first production was taken from No. 1 West Panel on the 19th of May and this was followed by production from No. 1 East Panel on the 13th of October. Development is underway to prepare No. 2 East and No. 2 West panels for production. Development work continues on No. 3 and No. 4 Slopes, and No. 2 and No. 3 Deeps.

Prince Mine

This mine is located at Point Aconi. The coal is extracted by a fully-mechanized retreat longwall method. Extraction was completed on No. 5 West face on the 20th of April and on No. 7 East face on the 16th of November. No. 4 AW face was started on the 24th of April and was finished on the 5th of October. Production was started on No. 6W face on the 13th of October. No. 8E face was ready for production at year end.

Surface Coal Mines

PIONEER COAL CO.

Manager:	D. Clifton
Address:	P.O. Box 929, Westville, N. S.
	B0K 2A0
Production:	113 515 t coal
Employees:	27

Extraction of the Acadia Seam crown pillar by open pit method was continued in 1987.

PIONEER COAL CO

Address: Reserve, Cape Breton Co.
Production: 127 934 tons (116 062 t) coal
Employees: 30

The coal is mined from the Gardiner Seam by open pit method east of Reserve, Cape Breton County, near the Sydney Airport. The operation includes a 100 ton/hr. (90 t/hr.) heavy media wash plant.

T. BROGAN & SONS CONSTRUCTION LTD.

Manager: T. Brogan
Address: P.O. Box 199, Florence, N. S. B0C 1J0
Production: 17 905 t coal
Employees: 22

This company operates an open pit coal mine at Point Aconi, Cape Breton County. The overburden is removed by a dragline excavator, and the exposed coal is ripped with a bulldozer and piled into trucks with a front-end loader.

Coal Reclamation Plants

SELMINCO INC.

Manager: D. Frederickson
Address: P.O. Box 189, New Waterford, N. S. B1H 4N9
Production: 59 463 t reclaimed coal
Employees: 20

Production ceased in October, 1987.

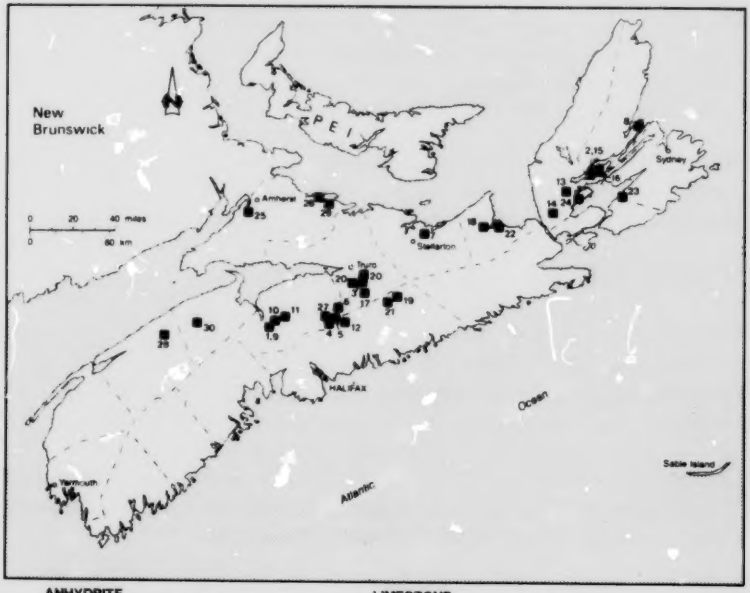
GAEL TECH INC.

Manager: Tony Fisher
Production: 7 052 t reclaimed coal
Employees: 30

This company has a plant to reclaim coal from the fines previously discarded by the Sydney Mines Wash Plant.

INDUSTRIAL MINERALS MINING

Industrial minerals form a significant part of the total mineral production in Nova Scotia. Seventeen industrial mineral producers operating at 27 sites produce gypsum, salt, anhydrite, limestone, barite, dolomite, clay and shale, silica sand, peat and dimension stone. The locations of these mines or quarries is shown on Figure B-5. Table B-3 summarizes production information. Additional information about secondary manufacturing is given in Table B-4.



ANHYDRITE
1. Fundy Gypsum Co. Ltd.
2. Little Narrows Gypsum Co. Ltd.

BARITE
3. Nystone Chemicals Ltd.

CLAY AND SHALE
4–7. L. E. Shaw Ltd

DOLOMITE
8. Scotia Limestone Ltd.

GYPSUM
9–10. Fundy Gypsum Co. Ltd.
11. Domtar Construction Materials
12. National Gypsum Canada Ltd.
13–14. Georgia-Pacific Corp.
15–16. Little Narrows Gypsum Company Ltd.
17. Lafarge Canada Ltd.
18. Nova Construction Ltd.
19. Mosher Ltd.

LIMESTONE
20. Lafarge Canada Inc.
21. Mosher Limestone Ltd.
22. Ridge Brokers Ltd.
23. Scotia Limestone Ltd.
24. Nova Scotia Sand and Gravel Ltd. (Marble)

SALT
25. Sifto Salt Division, Domtar Chemical Group
26. Canadian Salt Company Ltd.

SILICA SAND
27. Nova Scotia Sand and Gravel Ltd.

STONE
28. Heritage Memorials
29. Wallace Quarries Ltd.

PEAT MOSS
30. Annapolis Valley Peat Moss Co.

FIGURE B-5. Locations of industrial minerals, dimension stone and peat moss operations.

The province's numerous aggregate producers operating in both granular and bedrock deposits supply the provincial requirements, while two companies — Construction Aggregate Limited and Permanent Concrete Ltd. — supply aggregate to the export market.

Gypsum and Anhydrite

CANADA CEMENT LAFARGE LTD.

Manager:	G. Langford
Address:	P.O. Box 5, Brookfield, N. S. B0N 1C0
Production:	Nil
Employees:	See under Limestone

This small quarry is located just east of Brookfield, Colchester County, and operates only to supply the needs of the company's cement plant. The requirements for 1987 were purchased from other gypsum producers.

DOMTAR CONSTRUCTION MATERIALS LTD.

Manager:	S. G. Johnson
Address:	P.O. Box 758, Windsor, N. S. B0N 2T0
Production:	10 977 t gypsum products
Employees:	12

Domtar Construction Materials Ltd. reached its highest level of production since 1977 from the quarry at MacKay Settlement, Hants County. Domtar is the only gypsum producer in the province that calcines crude gypsum locally.

FUNDY GYPSUM CO. LTD.

Manager:	G. Raymond
Address:	P.O. Box 400, Windsor, N. S. B0N 2T0
Production:	55 971 t anhydrite
	1 537 856 t gypsum
Employees:	198

The Fundy Gypsum Co. Ltd. operates two quarries and crushing plants, located in the Wentworth Creek and Miller Creek areas near Windsor, Hants County. After selective quarrying, the materials are crushed and transported via unit train to shiploading facilities at Hantsport, for transport to wallboard manufacturing plants in the United States. The Wentworth Creek operation produces anhydrite and gypsum, and the Miller Creek operation produces gysum only.

GEORGIA PACIFIC CORPORATION

Manager:	J. Graham
Address:	P.O. Box 400, Port Hawkesbury, N. S. B0E 2V0
Production:	958 865 t gypsum
Employees:	60

Georgia Pacific Corporation operates two gypsum quarries in Inverness County. The River Denys quarry continued operations and the product is transported by rail to shiploading facilities at Port Hastings. A new quarry commenced operations in 1987 at Sugar Camp Lake. Production from Sugar Camp is transported by truck to dockside at Port Hastings.

LITTLE NARROWS GYPSUM COMPANY LTD.

Manager;	T. H. Davis
Address:	Little Narrows, N. S. B0E 1T0
Production:	98 140 t anhydrite 933 960 t gypsum
Employees:	103

Little Narrows Gypsum Company Ltd. operates two gypsum quarries and one anhydrite quarry near Little Narrows, Victoria County. In 1987, production from the second gypsum quarry, Norman MacAulay Quarry, begun. All the gypsum and anhydrite are shipped from the company's dock on St. Patrick's Channel in the Bras d'Or Lakes to destinations in Canada and the United States.

NATIONAL GYPSUM (CANADA) LTD.

Manager:	P. Mills
Address:	P.O. Box 637, Dartmouth, N. S. B2Y 3Y9
Production:	2 998 483 t gypsum
Employees:	119

National Gypsum operates the largest gypsum quarry in the province at East Milford, Halifax County. It is also the single largest gypsum quarry in the western world. National Gypsum set a new annual production record for the company in 1987. The company transports the gypsum by rail from Milford to Wright's Cove, Dartmouth, where it is loaded on ships bound for points in Canada and the United States.

Salt

CANADIAN SALT CO. LTD.

Manager:	Wm. McCormick
Address:	P.O. Box 160, Pugwash, N. S. B0K 1L0
Production:	795 587 t salt
Employees:	193

This mine is located in Pugwash, Cumberland County. A room and pillar system of extraction is employed, utilizing trackless diesel and electric equipment. The processing plant on-site produces industrial grades of salt, blocks for farm use and refined salt for domestic consumption. The industrial grades are either supplied in bulk for truck transportation, bagged for rail transportation or transported in bulk or bags to storage and shiploading facilities at the Pugwash Harbour wharf.

Development work began on the 1000 foot (305 m) level. At year end, the ramp had almost reached this level, and it is expected to be in production by 1988.

DOMTAR CHEMICALS GROUP, SIFTO SALT DIVISION

Manager:	J. Trebish
Address:	P.O. Box 550, Amherst, N. S. B4H 4A1
Production:	95 976 t salt
Employees:	97

Domtar Chemicals Group, Sifto Salt Division, operates a solution salt mine located near Nappan, Cumberland County. The mining procedure involves drilling a bore hole into the underground salt deposit. Water is pumped down to the deposit where it dissolves the salt, forming brine. The brine is then forced back to the surface, where the salt is extracted using the "vacuum pan" process.

Barite

NYSTONE CHEMICALS LTD.

Manager:	V. Prostak
Address:	P.O. Box 64, Debert, N. S. B0M 1G0
Production:	3 822 t ore mined
Employees:	11

The barite ore is mined, crushed and jigged by a contractor at the mine site northeast of Brookfield, Colchester County. This primary concentrate product is shipped to the company's plant at Debert, where it is upgraded to a pharmaceutical product.

In November of 1985, the hourly-paid employees went on strike. The strike continued through 1986 and 1987. Production was maintained by staff and some hourly-paid employees.

The company also purchased the stockpile of barite ore and concentrate from the bankrupt Scotsville Mineral Resources Mine, and transported it to Debert for processing.

Limestone and Dolomite

LAFARGE CANADA INC.
(Previously Canada Cement Lafarge Ltd.)

Manager:	G. Langford
Address:	P.O. Box 5, Brookfield, N. S. B0N 1C0
Production:	564 369 t limestone
Employees:	16 (Quarry)
	74 (Cement Plant)

Lafarge Canada Inc. operates a limestone quarry and plant at Brookfield, Colchester County. The total production from the quarry is processed at the on-site cement manufacturing plant which is owned and operated by the company.

MOSHER LIMESTONE LTD.

Manager:	R. Mosher
Address:	P.O. Box 28, Upper Musquodoboit, N.S.
	B0N 2M0
Production:	110 943 t limestone
Employees:	24

Mosher Limestone operates two quarries in the Upper Musquodoboit, Halifax County area, and one near Cooks Brook, Halifax County. The company produces an agricultural-grade dolomite and limestone. When processed, the product is supplied in bulk or bagged for wide distribution throughout the Atlantic Provinces as a soil conditioner.

RIDGE BROKERS LTD.

Manager:	A. Alward
Address:	P.O. Box 59, Havelock, N. B. E0A 1W0
Production:	30 000 t limestone
Employees:	6

The company operates a small limestone quarry at South Side, Antigonish Harbour, Antigonish County.

SCOTIA LIMESTONE LTD.

Manager:	J. D. Coffin
Address:	P.O. Box 457, Sydney, N. S. B1P 6H4
Production:	11 023 tons (10 000 t)
Employees:	6

Scotia Limestone Ltd. has contracted Mosher Limestone Ltd. to work the Kelly Cove quarry to produce agricultural-grade dolomite, aggregate and limestone for Sydney Steel and the mineral filler market.

Clay, Shale, Industrial Sand and Marble

L. E. SHAW LTD. (NOVA SCOTIA SAND AND GRAVEL)

President:	A. Shaw
Address:	5251 Duke Street, Halifax, N.S. B3J 1P3
Production:	44 200 t clay and shale 25 200 t industrial sand 2 447 t marble
Employees:	21

L. E. Shaw and its subsidiary company, Nova Scotia Sand and Gravel, operate seven properties in Nova Scotia. The clay and shale are quarried from pits at Lantz, Milford and Shubenacadie (all in Hants County) and from a quarry in New Glasgow, Pictou County. The materials quarried are used in the company plant located in Lantz, Hants County, for the manufacture of bricks and tiles. The company also produces industrial sand at Elmsdale, Brazil Lake and Sandy Desert, and architectural limestone from the Marble Mountain quarry.

Brick production from the Lantz plant was 19 500 000. This plant employed an additional 55 people.

AGGREGATE RESOURCES

Crushed stone and sand and gravel comprise the structural materials category. Production infor mation is summarized in Table B-5.

Crushed Stone

The province had 17 rock quarry operations that produced a total of 5 601 355 t in 1987, and employed 230 people.

Sand and Gravel

There were 63 private sector producers of sand and gravel operating in the province. Production was 5 601 355 t, and 375 people were employed. Total production, which includes that of the Nova Scotia Department of Transportation, was 7 430 000 t.

MISCELLANEOUS MATERIALS PRODUCTION

The production of miscellaneous materials is shown in Table B-6. Locations are shown on Figure B-5.

Dimension Stone

HERITAGE MEMORIAL LTD.

Owner:	G. Nelson
Address:	P.O. Box 308, Windsor, N.S. B0N 2T0
Production:	400 t
Employees:	21

The company periodically operates a small quarry at Nictaux West, Annapolis County, to obtain grey granite as part of its requirements for memorial works at Windsor. The operation depends on market requirements.

ARSENAULT MONUMENT WORKS LTD.

Owner:	P. Arsenault
Address:	P.O. Box 1475, Antigonish, N.S. B3B 2L4

Arsenault Monument Works Ltd. periodically oper ates a quarry at Lock Katrine, Antigonish County, for the production of dimension stone used in memorials. No production was recorded in 1987.

WALLACE QUARRIES LTD.

Owner:	S. Flynn
Address:	P. O. Wallace, Cumberland Co., N. S. B0K 1Y0
Production:	1133 t
Employees:	4

The Wallace Quarries have been reopened as a source of building stone for major building rehabilitation work in Halifax, Sydney and Ottawa.

Peat Moss

ANNAPOLIS VALLEY PEAT MOSS CO.

President:	H. Endres
Address:	Berwick, Nova Scotia B0P 1E0
Production:	9 500 t peat moss
Employees:	50 (some part-time)

The peat bog is approximately 500 acres (200 ha) in area and, depending on the weather, up to 500 m^3 per day are harvested during the five summer months.

TABLE B-1. Metallic mineral production for the calendar year 1987

COMPANY	LOCATION	PRODUCTION		TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] $
COPPER					
Rio Algom Limited	East Kemptville, Yarmouth County	625,709 (lbs.) (copper-in-concentrate)	283 817 kg	—[3]	688,000
GOLD					
Seabright Resources Inc.	Forest Hills, Guysborough County Beaver Dam, Halifax County	4,459 (troy ozs.)	138 690 g	180	2,639,700
Edgar Horne	Renfrew, Hants County	21 (troy ozs.)	653 g	1	12,400
	TOTAL (Gold)	4,480 (troy ozs.)	139 343 g	181	2,652,100
SILVER					
Seabright Resources Inc.	Forest Hills, Guysborough County	221 (troy ozs.)	6 874 g	—[3]	2,100
Rio Algom Limited	East Kemptville, Yarmouth County	12,297 (troy ozs.)	382 479 g	—[3]	118,000
	TOTAL (Silver)	12,518 (troy ozs.)	389 353 g	—[3]	120,100
TIN					
Rio Algom Limited	East Kemptville, Yarmouth County	7,449,784 (lbs.)	3 379 165 kg (tin — in — concentrate)	225	31,214,600

TABLE B-1. Continued

COMPANY	LOCATION	PRODUCTION	TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] $
TOTAL FOR METALLIC MINERAL PRODUCTION			406	34,674,800

[1]total number of employees including office, clerical, supervisory, mining and production
[2]estimated value based on average annual metal price times volume
[3]included elsewhere

May 25, 1989

TABLE B-2: Coal production for the ca;emdar uear 1987

COMPANY	MINE NAME	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL[1] NUMBER EMPLOYED	APPROXIMATE VALUE[2] ($)
UNDERGROUND MINING						
Cape Breton Development Corp. (CBDC)	Prince Mine	Point Aconi, Cape Breton County	2,832,004[2]	2 569 177	3,546	
	Phalen Mine	Lingan, Cape Breton County				
	Lingan Mine	Lingan, Cape Breton County				
Evans Coal Mines Ltd.		St. Rose, Inverness County	38,046	34 515	45	
		TOTAL (underground)	2,870,050	2 603 692	3,591	
OPEN PIT MINING						
T. Brogan Ltd.		Point Aconi, Cape Breton County	19,740	17 908	22	
Pioneer Coal Company		Westville, Pictou County	125,605	113 948	27	
		Reserve Mines, Cape Breton County	124,709	113 135	30	
		TOTAL (open pit)	270,054	244 991	79	

TABLE B-2. Continued

COMPANY	MINE NAME	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL[1] NUMBER EMPLOYED	APPROXIMATE VALUE[2] ($)
RECLAMATION						
Gael Tech Inc.		Sydney Mines, Cape Breton County	11,807	10 711	30	
Selminco Inc.		Sydney Mines, Cape Breton County	70,355	63 826	20	
		TOTAL (reclamation)	82,162	74 537	50	
TOTAL FOR ALL COAL PRODUCERS			3,222,266	2 923 220	3,720	178,311,000

[1]personnel employed in clerical, supervisory, and other positions as well as mining personnel
[2]disposition plus internal use
[3]estimated from Nova Scotia Department of Mines and Energy sources

May 23, 1989

TABLE B-3. Industrial minerals production for the calendar year 1987

COMPANY	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL[1] NUMBER EMPLOYED	APPROXIMATE VALUE[2] ($)
GYPSUM					
Domtar Construction Materials Ltd.	Windsor, Hants County	12,100	10 977	3	
Fundy Gypsum Co. Ltd.	Miller Creek and Wentworth, Hants County	1,712,103	1 553 210	198	
Georgia Pacific Corp.	River Denys, Inverness County	943,806	856 215	60	
Little Narrows Gypsum Co.	Little Narrows, Victoria County	1,064,265	965 495	103	
National Gypsum (Canada) Ltd.	Milford, Halifax County	3,305,229	2 998 484	119	
Nova Construction Limited	Brierly Brook, Antigonish County	689	625	3	
	TOTAL (gypsum)	7,038,192	6 385 006	486	54,179,200
ANHYDRITE					
Fundy Gypsum Co. Ltd.	Miller Creek and Wentworth Creek, Hants County	61,697	55 971	see gypsum	
Little Narrows Gypsum Co. Ltd.	Little Narrows, Victoria County	108,180	98 140	see gypsum	
	TOTAL (anhydrite)	169,877	154 111	1,309,900	

TABLE B-3. Continued

COMPANY	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL[1] NUMBER EMPLOYED	APPROXIMATE VALUE[2] ($)
SALT					
Canadian Salt Co.	Pugwash, Cumberland County	958,821	869 837	193	
Sifto Salt Division Domtar Chemical Group	Nappan, Cumberland County	108,989	98 874	97	
	TOTAL (salt)	1,067,810	968 711	290	50,105,400[3]
LIMESTONE					
Canada Cement Lafarge, Ltd.	Brookfield, Colchester County	622,104	564 369	16	
Mosher Limestone Ltd.	Upper Musquodoboit, Halifax County	122,292	110 943	24	
Ridge Brokers Ltd.	Southside Harbour, Antigonish County	33,069	30 000	6	
Scotia Limestone Ltd.	Irish Cove, Cape Breton County	11,023	10 000	6	
	TOTAL (limestone)	788,488	715 312	52	1,899,900
DOLOMITE					
Scotia Limestone Ltd.	Kellys Cove, Victoria County TOTAL (dolomite)	22,449	20 366	8	183,300

TABLE B-3. Continued

COMPANY	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL[1] NUMBER EMPLOYED	APPROXIMATE VALUE[2] ($)
BARITE					
Nystone Chemicals Ltd.	Brookfield, Colchester County TOTAL (barite)	871	790	11	1,360,000[3]
CLAY					
L. E. Shaw Ltd.	Lantz, Halifax County Shubenacadie, Halifax County	29,211	26 500	4	0[4]
SHALE					
L. E. Shaw Ltd.	Milford, Hants County New Glasgow, Pictou County	19,511	17 700	see clay	0[4]
	TOTAL (clay and shale)	48,722	44 200	4	0[4]
SILICA SAND					
Nova Scotia Sand and Gravel Ltd.	Nine Mile River, Hants County TOTAL (silica sand)	27,778	25 200	13	1,800,000[3]

TABLE B-3. Continued

COMPANY	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL[1] NUMBER EMPLOYED	APPROXIMATE VALUE[2] ($)
	TOTAL FOR INDUSTRIAL MINERALS	9,164,187	8 313 696	864	110,837,770

[1]total employees: mining, production, clerical, supervisory, etc.
[2]estimate from Nova Scotia Department of Mines and Energy sources
[3]processed or manufactured value
[4]value assigned to the higher manufactured valuation (bricks)
NOTE — production represents shipments

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TABLE B-4. Secondary mineral manufacturing for the calendar year 1987

COMPANY	LOCATION	PRODUCTION		TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] $
MANUFACTURED BRICKS					
L. E. Shaw Ltd.	Lantz, Halifax County	19,500,000 (bricks)		55	7,916,900
PLASTER PRODUCTS					
Domtar Construction Materials	Windsor, Hants County	11,090 (tons)	10 061 (tonnes)	12	2,000,000
PORTLAND CEMENT					
Canada Cement Lafarge Ltd.	Brookfield, Colchester County	412,520 (tons)	374 236 (tonnes)	74	46,779,500
	TOTAL FOR SECONDARY MINERAL MANUFACTURING			141	56,696,400

[1]total number of employees including office, clerical, supervisory, mining and production
[2]estimate from Nova Scotia Department of Mines and Energy sources

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TABLE B-5. Aggregate materials production for the calendar year 1987

COMPANY	LOCATION (Head Office)	PRODUCTION tons	PRODUCTION tonnes	TOTAL NUMBER	APPROXIMATE VALUE[2] ($)
CRUSHED STONE					
1. Archibald Drilling Supplies Ltd.	Upper Musquodoboit, Halifax County	33,069	30 000	2	
2. Doug Burns Excavation Contracting Ltd.	Sydney, Cape Breton County	93,696	85 000	9	
3. Conrad Brothers Ltd.	Montague, Halifax County	1,244,108	1 128 647	49	
4. Construction Aggregates Ltd.	Mulgrave, Guysborough County	1,672,352	1 517 148	55	
5. Gateway Materials Ltd.	Kearney Lake Rd., Halifax County	584,917	530 633	20	
6. LeVatte Construction Company Ltd.	Sydney, Cape Breton County	43,155	39 150	6	
7. Colin R. MacDonald Ltd.	Antigonish, Antigonish County	12,006	10 892	6	
8. Rocky Lake Quarry Ltd.	Bedford, Halifax County	1,763,680	1 600 000	40	
9. South Shore Sand & Gravel Ltd.	Bridgewater, Lunenburg County	137,788	125 000	10	
10. S. W. Weeks Const. Ltd.	New Glasgow, Pictou County	227,076	206 002	27	
11. W. Eric Whebby Ltd.	Dartmouth, Halifax County	395,597	358 883	7	
	TOTAL (crushed stone)	6,207,444	5 631 355	231	28,156,775
Sand and Gravel					
12. Aberdeen Paving Ltd.	Halifax, Halifax County	518,705	470 566	35	
13. Acadia Road Contractors Ltd.	Bridgewater, Lunenburg County	210,539	191 000	17	
14 Bert Balcon Excavating	Middleton, Annapolis County	59,202	53 708	3	
15. R. Bar Construction	Sydney, Cape Breton County	21,206	19 238	1	
16. Briggs Construction	Bras D'Or, Cape Breton County	9,370	8 500	2	
17. Budget Paving Ltd.	Liverpool, Queens County	14,597	13 242	3	
18. Burke Brothers Trucking	St. Peter's, Richmond County	17,573	15 942	7	
19. Canadian Pacific Railway (CPR)	Round Hill, Annapolis County	24,140	21 900	—	
20. Carson Enterprises Ltd.	Antigonish, Antigonish County	12,676	11 500	3	

TABLE B-5. Continued

COMPANY	LOCATION (Head Office)	PRODUCTION tons	PRODUCTION tonnes	TOTAL NUMBER	APPROXIMATE VALUE[2] ($)
21. D. J. Comeau	Metagan River, Digby County	7,474	6 780	1	
22. Jerry S. Coulter Ltd.	Wallace, Cumberland County	6,181	5 607	3	
23. Gordon F. Creelman Ltd.	Stewiacke, Colchester County	12,125	11 000	1	
24. Cumberland Paving & Contr. Ltd.	Amherst, Cumberland County	143,299	130 000	4	
25. L. Davis	Mount Uniacke, Hants County	79,998	72 574	2	
26. Gus D'Eon Excavating Ltd.	West Pubnico, Yarmouth County	38,691	35 100	6	
27. Dexter Construction Ltd.	Bedford, Halifax County	350,531	318 000	5	
28. Dillman Enterprises Ltd.	Shubenacadie, Colchester County	861,999	782 000	18	
29. Dunn Const. Co. Ltd.	Baddeck, Victoria County	138,769	125 890	8	
30. Ettinger Enterprises Ltd.	Kennetcook, Hants County	5,952	5 400	1	
31. R. B. Ferguson Construction	Marion Bridge, Cape Breton County	40,179	36 450	3	
32. L. & M. Gallant Contr., Trucking Ltd.	Elmsdale, Hants County	71,650	65 000	7	
33. Gays River Aggregate	Gays River, Halifax County	165,345	150 000	7	
34. Gillis Construction Ltd.	Baddeck, Victoria County	1,287	1 168	1	
35. W. C. Hall & Sons Excavating Ltd.	Cornwallis, Annapolis County	24,251	22 000	4	
36. Roy Hiltz Excavators Ltd.	Kingston, Kings County	48,282	43 801	5	
37. Inter Supply Ltd.	New Glasgow, Pictou County	163,345	150 000	12	
38. Isle Madame Construction Co. Ltd.	Arichat, Richmond County	1,561	1 416	3	
39. G. K. Keddy (L. E. Shaw)	Lantz, Hants County	290,918	263 919	16	
40. Kell's Enterprises Ltd.	Antigonish, Antigonish County	8,818	8 000	4	
41. LeVatte Construction Company Ltd.	Sydney, Cape Breton County	95,321	86 475	7	
42. D. J. Lowe Ltd.	Deep Brook, Annapolis County	27,412	24 868	4	
43. MacDonald's Backhoe & Trucking	North Sydney, Cape Breton County	2,999	2 721	2	
44. Colin R. MacDonald Ltd.	Antigonish, Antigonish County	305,145	276 826	27	
45. Malcolm S. MacDonald Co. Ltd.	Sydney River, Cape Breton County	101,855	92 402	5	
46. J. P. MacInnis Trucking	Whycocomagh, Inverness County	1,637	1 485	1	

TABLE B-5. Continued

COMPANY	LOCATION (Head Office)	PRODUCTION tons	PRODUCTION tonnes	TOTAL NUMBER	APPROXIMATE VALUE[2] ($)
47. D. W. Matheson & Sons	Whycocomagh, Inverness County	1,102	1 000	2	
48. Martell's Const. Ltd.	North Sydney, Cape Breton County	213,544	193 726	15	
49. Maurice's Ready-Mix Ltd.	Kentville, Kings County	54,963	49 862	3	
50. Meadows Sand & Gravel Ltd.	Sydney, Cape Breton County	106,758	96 850	8	
51. Moore Enterprises	Deep Brook, Digby County	22,046	20 000	4	
52. Mosher Limestone Co. Ltd.	Musquodoboit, Halifax County	9,999	9 071	2	
53. Mosher & Rawding Ent. Ltd.	Liverpool, Queens County	58,248	52 842	3	
54. Municipal Ready-Mix Ltd.	Sydney, Cape Breton County	359,168	325 835	23	
55. North River Sand & Gravel Ltd.	Truro, Colchester County	7,000	6 350	4	
56. Nova Scotia Sand & Gravel Ltd.	Halifax, Halifax County	152,293	138 159	20	
57. Permanent Concrete Ltd.	Folly Lake, Cumberland County	282,224	256 032	11	
58. H. W. Phillips Ltd.	Mira Gut, Cape Breton County	27,558	25 000	4	
59. Pictou County Excavators Ltd.	New Glasgow, Pictou County	2,205	2 000	1	
60. Pictou West Crushing	Scotsburn, Pictou County	19,841	18 000	1	
61. Arthur Pugsley	Parrsboro, Cumberland County	8,185	7 425	3	
62. Scott Paper International	New Glasgow, Pictou County	397,908	360 980	—	
63. W. K. Sharpe and Sons Construction Ltd.	Avonport, Kings County	14,999	13 607	3	
64. V. H. Shaw	Avonport, Kings County	55,854	50 670	2	
65. D. M. Snow Construction	Barrington Passage, Shelburne County	14,881	13 500	6	
66. Standard Paving Maritime Ltd.	Halifax, Halifax County	289,240	262 397	17	
67. Earle Toole Trucking Ltd.	Truro, Colchester County	21,098	19 140	5	
68. Warren Maritimes Ltd.	New Glasgow, Pictou County	264,499	239 952	5	
69. Will-Kare Paving & Const. Ltd.	Truro, Colchester County	194,466	176 418	6	
70. Yarmouth Concrete & Gravel Ltd.	Yarmouth, Yarmouth County	185,186	168 000	9	
71. Zutphen Brothers Const. Ltd.	Port Hood, Inverness County	55,115	50 000	1	
	Subtotal	6,701,412	6 081 294	386	24,325,176

TABLE B-5. Continued

COMPANY	LOCATION (Head Office)	PRODUCTION tons	PRODUCTION tonnes	TOTAL NUMBER	APPROXIMATE VALUE[2] ($)
NON-REPORTING (mainly Nova Scotia Department of Transportation)		1,933,237	1 753 821	109	7,015,284
TOTAL (sand and gravel)		8,634,649	7 835 115	495	31,340,460
TOTAL FOR AGGREGATE MATERIALS PRODUCTION		14,842,093	13 466 470	725	59,497,235

[1]Average number of people during production period
— Not applicable

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TABLE B-6. Miscellaneous commodity production for the calendar year 1987

COMPANY	LOCATION	PRODUCTION tonne	PRODUCTION tonnes	TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] $
DIMENSION STONE					
Heritage Memorials Ltd.	Quarry: Nictaux, Annapolis County Plant: Windsor, Hants County	468	425	21	56,100
Nova Scotia Sand and Gravel	Quarry: Marble Mountain, Inverness County	2,697	2 447	4	157,000
Wallace Quarries Ltd.	Quarry: Wallace, Cumberland County	124	113	4	37,500
	TOTAL (dimension stone)	3,290	2 985	29	250,600
PEAT MOSS					
Annapolis Valley Peat Moss Company	Berwick, Kings County TOTAL (peat moss)	8,267	7 500	50	1,100,000[3]
TOTAL FOR MISCELLANEOUS COMMODITY PRODUCTION		79	1,350,600	79	1,350,600

[1]total number of employees including office, clerical, superivisory, mining and production
[2]estimate from Nova Scotia Department of Mines and Energy sources
[3]processed or manufactured value

APPENDIX C

PRIVATE SECTOR EXPLORATION

Exploration Activity

The level of mineral exploration activity increased dramatically during the calendar year 1987, with total expenditures estimated at about $45 million (all minerals except petroleum); more than double the $22 million spent in 1986. Exploration for gold accounted for the large increase in expenditures, as companies continued to focus primarily on precious metal exploration. Base metal and coal exploration continued at low levels compared to 1985-86, while exploration for industrial minerals, primarily limestone and gypsum, showed a significant increase over recent years as industrial mineral producers continue to expand operations.

The record expenditure levels in 1987 can be partly attributed to the advanced stage of several gold exploration projects include underground exploration and development work. In addition, the continued stability in the price of gold and the continuing availability of flow-through financing have played a major role in the current level of gold exploration in the province. The success of several junior companies in delineating significant tonnages of ore-grade reserves has also resulted in establishing the credibility of historic gold mining camps in Nova Scotia.

More than 225 companies and individuals held exploration licences or options in the province in 1987, including 24 major, 28 junior and 25 private companies. In addition, several mining lease holders carried out exploration on their leases or on unclaimed ground where commodities did not require licenses (e.g. limestone, gypsum).

Mining Exploration

Gold Exploration for metallic minerals in the province continued to focus on gold during 1987, with interest concentrated primarily on the historic gold districts throughout southern and eastern mainland Nova Scotia. Gold exploration was also carried out in the Cambrian and Hadrynian volcano-sedimentary rocks in other areas of the province, including the Cape Breton Highlands, the Antigonish Highlands and southeastern Cape Breton Island.

Most gold exploration programs were initiated by junior companies, although the number of exploration projects undertaken by major companies also increased during 1987. Gold exploration increased significantly from 1986,

with several large-scale exploration and development projects being developed. (Fig. C-1). The majority of these projects continued from the previous year.

Seabright Resources Incorporated continued a detailed surface exploration program as well as underground development work on the Forest Hill property in Guysborough County. The company continued underground bulk sampling and diamond drilling on the main zone (Teasdale Mine) and completed surface diamond drilling on a zone east of the shaft. A development ramp was started on the east zone to facilitate underground diamond drilling and bulk sampling. Seabright also continued a detailed underground bulk sampling and diamond drilling program on the Beaver Dam property in Halifax County.

A detailed surface and underground exploration program, was carried out by Seabright on the Caribou gold property in Halifax County. The company completed a small drilling program early in the year and began a large-scale surface exploration program, consisting of soil geochemistry, ground geophysics and diamond drilling, later in the year. The Holman shaft was de-watered to facilitate a detailed underground evaluation of the old workings. This included geological mapping, extensive geochemistry and diamond drilling. The company also continued a large surface exploration program on the Moose River gold property in Halifax County, consisting of extensive diamond drilling.

A large-scale regional exploration program for gold, consisting primarily of reconnaissance geochemical sampling and prospecting, was carried out by Seabright in several areas throughout Halifax and Guysborough Counties. The company examined the strike extension of several anticlinal structures that host a number of significant gold deposits. Follow-up work was completed on several properties which involved additional geochemical sampling and diamond drilling.

Coxheath Gold Holdings Limited continued a detailed surface and underground exploration program on the Tangier gold property in Halifax County. A decline was collared early in the year and underground diamond drilling and bulk sampling were done in two phases. The company completed additional surface diamond drilling along the strike extension of the mineralized structure currently under development. Coxheath also wrapped up a surface exploration program consisting of diamond drilling on the Gold River property in Lunenburg County, and airborne geophysical surveys were completed over several of the company's properties throughout the province.

Acadia Mineral Ventures Limited continued a large-scale surface exploration program on the Mooseland gold property in Halifax County. The company began an extensive drilling program during the year to outline ore reserves on the "west zone", near the old workings, and on the recently

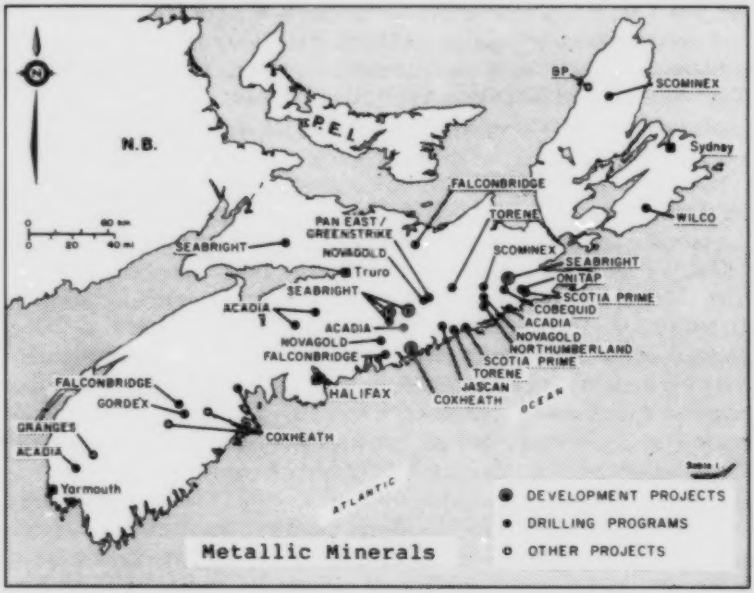

FIGURE C-1. Locations of private sector mineral exploration projects.

discovered faulted strike extension of the zone to the east. The company also completed exploration programs consisting of ground geophysical surveys and diamond drilling on the Mount Uniacke gold property in Hants County, the Wine Harbour gold property in Guysborough County and the Carleton gold property in Yarmouth County.

NovaGold Resources Incorporated continued a large-scale surface exploration program on part of the Fifteen Mile Stream gold property in Halifax County. The company carried out a detailed diamond drilling program on the property, and began a program of surface stripping and bulk sampling late in the year. Through an option agreement with Pan East Resources Incorporated, Greenstrike Gold Corporation also continued a large-scale diamond drilling program on the same property which is in the vicinity of the old workings along the north boundary of the NovaGold property. Ground geophysical surveys and diamond drilling was carried out by NovaGold on the Lake Charlotte gold property in Halifax County and at East Lake, 4 km southwest of the Fifteen Mile Stream project.

Torene Gold Exploration Limited continued a detailed exploration program on the Harrigan Cove gold property in Halifax County, consisting of ground geophysical surveys and diamond drilling. The company also completed soil geochemical sampling and diamond drilling on a gold property in the vicinity of Mitchell Brook, 7 km southwest of Lower Caledonia in Guysborough County.

Onitap Resources Incorporated, partly through an option agreement with Greenstrike Gold Corporation and Petromet Resources Limited, continued a detailed diamond drilling program on the Upper Seal Harbour gold property in Guysborough County. Scotia Prime Resources Limited completed soil geochemical surveys and diamond drilling on the Lower Seal Harbour gold property, 4 km southeast of the Onitap property. Scotia Prime also completed soil geochemical surveys and diamond drilling on the Ecum Secum gold property in Halifax County.

Several additional gold exploration programs in the Meguma Group were completed or were still in progress at the end of the fiscal year. Northumberland Mines Limited continued an extensive diamond drilling program on the Goldenville gold property in Guysborough County, and Jascan Resources Incorporated completed a detailed diamond drilling program on the Salmon River gold property in Halifax County. Falconbridge Limited wrapped up ground geophysical surveys and diamond drilling on the Brookfield gold property in Queens County, and Gordex Minerals Limited carried out a large-scale exploration program consisting of soil geochemical sampling, ground geophysical surveys and diamond drilling on the Molega gold property in Queens County.

Sunrise Metals Corporation carried out soil geochemical surveys, ground geophysical surveys and diamond drilling in the Lake Fraser area, 7 km southeast of Beaver Dam.

Several gold exploration programs were also completed in other geological environments in eastern Nova Scotia. Inco Limited, as operator of the Scotian Mineral Exploration Venture group (SCOMINEX), completed detailed follow-up work consisting of geochemical and geophysical surveys, and trenching and diamond drilling in the MacMillan Flowage area, 25 km southeast of Cheticamp, Inverness County. The company also carried out an airborne geophysical survey over the Big Pond area in Cape Breton County.

BP Resources Canada Limited completed additional follow-up work, consisting primarily of trenching on a property in the Faribault Brook area, 6 km east of Cheticamp, Inverness County. Noranda Exploration Company Limited continued a small exploration program near Whycocomagh in Inverness County. In other areas, Torene Gold Exploration Limited carried out an airborne geophysical survey in the Browns Mountain area of the Antigonish Highlands, and Coxheath Gold Holdings Limited completed an airborne geophysical survey over the Coxheath property in the Boisdale Hills area, 15 km west of Sydney.

In addition to the above exploration programs, several small-scale gold exploration projects were carried out by various companies and individuals throughout the province.

Base Metals Falconbridge Limited completed a small exploration program for tin-tungsten in the Ship Harbour area, Halifax County, consisting of ground geophysical surveys and diamond drilling. The company also carried out a small diamond drilling program on the Kirkmount base metal property, 9 km southeast of Stellarton, Pictou County. Granges Exploration Limited completed ground geophysical sureys on a tin property in the Solomon Lake area, Yarmouth County.

Wilco Mining Company Limited continued a detailed diamond drilling program for base metals on the Stirling property in southeastern Cape Breton Island. Coxheath Gold Holdings Limited completed an airborne geophysical survey near Oceanview, 20 km west of Louisbourg, Cape Breton County.

Gypsum Exploration for gypsum is concentrated primarily in the Windsor and Milford Station areas in central mainland Nova Scotia. Work, which consisted primarily of diamond drilling, was initiated by Domtar Incorporated near their quarry at McKay Section east of Windsor, by National Gypsum in the vicinity of their quarry near Milford Station and by Fundy Gypsum at Dutch Settlement.

Limestone Lafarge Canada explored for limestone in the Maitland area, Hants County. The company examined a number of limestone occurrences and completed ground geophysical surveys, overburden drilling and diamond drilling on several properties.

Graphite Carbontec Industries Limited continued a surface exploration program for graphite on a property at Glendale, Inverness County.

Magnetite Lodestone Limited completed a small exploration program, consisting of ground geophysics and diamond drilling, on a magnetite property 7 km north of Bass River, Hants County.

Manganese Aurion Minerals Limited finished a small underground sampling program for manganese on the Cain property, 5.5 km northeast of Aldersville, Lunenburg County.

Coal Coal exploration continued on the Suncor Incorporated coal project at Plymouth, Pictou County. Under an option agreement with Suncor, Placer Development Limited completed additional diamond drilling as part of a detailed evaluation of the coal reserves developed to date by Suncor.

Mining Development

Gold Seabright Resources Incorporated continued underground development work on the Forest Hill gold property in Guysborough County and the Beaver Dam gold property in Halifax County. Underground diamond drilling, extensive drifting and cross-cutting, and raising and bulk sampling continued on the −155 m and −200 m levels at Forest Hill (Teasdale Mine). A decline was also driven on the Kennedy zone, 1800 m east of the shaft. Underground diamond drilling and bulk sampling continued on the Beaver Dam property.

Coxheath Gold Holdings Limited began an underground exploration and development program on the Tangier gold property in Halifax County at the beginning of the year. Development work included the construction of a decline, drifting and cross-cutting, and raising to facilitate bulk sampling of drill-indicated ore reserves. In addition, the company began the construction of an on-site 250/tpd mill.

Gypsum Two properties on Cape Breton Island were principal sites for gypsum development projects. Little Narrows Gypsum Company continued development drilling to expand on current reserves at the Little Narrows deposit 14 km east of Whycocomagh, and Georgia Pacific continued development drilling on the Sugar Camp deposit 12 km northeast of Port Hawkesbury.

Limestone Lafarge Canada Inc. completed development drilling for limestone at Manganese Mines 11 km east of Truro and Mosher Limestone Company Limited completed the final stages of development work, including the construction of a mill, on the Kelly Cove limestone-dolomite property 35 km northeast of Baddeck.

Coal The Cape Breton Development Corporation completed the final stages of surface and underground development work on the Phalen mine during the year.